

# 2009 WATER QUALITY DATA SUMMARY FOR THE IDAHO COBALT PROJECT

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**APRIL 2010**

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**IDAHO COBALT PROJECT - SAMPLE COORDINATES (As of October 2011)**

Site ID	Mine Grid-E	Mine Grid-N	Easting	Northing	Elevation (ft)
WQ-1	14695.1262	32397.0699	711592.952	5005379.745	
WQ-2	14307.335	31387.977	711483.07	5005069.25	4380
WQ-3					
WQ-4	17041.4063	29922.6143	712332.675	5004649.692	
WQ-5	17231.16	29561.458	712418.384	5004589.037	4325
WQ-6	17546.8791	29760.3127	712488.291	5004605.36	
WQ-7	6557.936	24229.914	709201.221	5002815.857	
WQ-9	6178	23290	709087.412	5002553.888	7470
WQ-10	-234.583	23505.14	707149.302	5002515.569	6220
WQ-11	-72.135	25832.329	707105.434	5003220.096	5880
WQ-13	346.247	23164.158	707307.87	5002428.996	6370
WQ-14	5129.208	18602.8	708821.279	5001091.199	7660
WQ-15	6058.968	19029.862	709102	5001219	7555
WQ-16	-285.428	19225.93	707163	5001214	6983.802
WQ-17	396.35	19846.065	707450	5001363	6935
WQ-18	-422.703	21730.127	707101.997	5001871.612	6455
WQ-19	-236.527	24912.292	707154.802	5003078.956	5960
WQ-20	-1856.962	27551.515	706678.481	5003649.356	5350
WQ-21a					
WQ-22	-961.399	29945.797	706846.623	5004418.603	5150
WQ-23	-1243.165	30157.661	706775.871	5004526.678	5150
WQ-24a	-271.25	30530.84	707218.0447	5004665.502	
WQ-25	12467.675	34579.481	710976.24	5005960.274	4220
WQ-25a					
WQ-28	12830.1	33861.82	711010.0307	5005807.087	
WQ-29					
WQ-30					
SS-1	4029.6831	24068.7631	708428.23	5002735.02	
SS-2	5135.1587	26067.4625	708744.78	5003355.03	
SS-3	6791.6576	27423.0664	709235.68	5003784.71	
SS-5	7950.9832	19928.0118	709664.57	5001513.3	
SS-7	4471.2749	19117.4156	708612.781	5001231.215	
SS-9	5509.6916	19516.413	708925.069	5001363.25	
SS-11	565.8492	22988.6637	707384	5002371	
SS-12	1746.2224	25048.2366	707722.75	5003010.31	
BFMW-1a					
BFMW-3	6512.05	23881.76	709186.309	5002703.106	7459.09
BFMW-4s	6243.33	20958.12	709137.378	5001816.747	7683.19
BFMW-4d	6245.37	20962.38	709137.43	5001815.258	7683.15
BFMW-5a					
BFMW-6	3367.2	21124	708256.507	5001821.719	7963.82
BFMW-8					
BFMW-9					
BFMW-10					
BFMW-11			708800.7	5002327.1	
BFMW-12					
BFMW-13					
RMW-1	2025.84	22765.81	707834.624	5002322.398	7354.04
RMW-2	551.15	23251.1	707306.144	5002540.898	6506.27

RMW-3	673.52	22329.63	707426.738	5002177.165	6849.13
RMW-5a					
RMW-6	715.2429	24306.11	707416.1949	5002773.827	6536.216
RMW-7	419.7126	21559.12	707353.9301	5001934.059	6886.97
RMW-8					
RMW-9a					
RMW-10					
RMW-11					
RMW-12					
RMW-13					
RMW-14					
RCW-1					
RCW-2					
RCW-3					
RCW-4					
RCW-5					
RCW-6					
RCW-7					
RCW-8					
RCW-9					

# **2009 Water Quality Data Summary for the Idaho Cobalt Project**

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## 2009 Water Quality Data Summary for the Idaho Cobalt Project

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## 1.0 INTRODUCTION

In 2009, twenty-one samples were collected at seven monitoring well locations, no samples were collected at Seep and Spring locations, and 58 samples were collected at 15 surface water sampling locations in accordance with the 2008 Water Monitoring Plan for the Idaho Cobalt Project (May 2008) prepared by Telesto Solutions, Inc (Telesto). The locations of monitoring wells and surface water monitoring locations sampled in 2009 are identified on Figure 1-1. A complete listing of 2009 water monitoring data is provided in Appendix A. This report focuses on the water quality of selected constituents within the historic period from 2000 through 2009.

## **2.0 GROUNDWATER REVIEW**

### **2.1 Depth to Water**

The 2009 water level measurements for all wells are provided in Tables 2-1, and 2-2. The water levels at BFMW-1 (Figure 2-1a) increased between September 2008 and June 2009 and then decreased through the remainder of 2009. This trend is similar to that seen in 2005, 2006, 2007, and 2008. Water levels remained stable in BFMW-3 (Figure 2-2a), with an approximate decrease of two feet between June 2009 and October 2009. The depth to water increased between September 2008 and June 2009 in BFMW-4d (Figure 2-3a). The water levels then decreased through the remainder of 2009 exhibiting a trend similar to that seen in 2005, 2006, 2007, and 2008.

Water levels in RMW-2 and RMW-3 were stable in 2009 (Figures 2-4a and 2-5a), with an approximate decrease of one foot between June and October. The water levels in RMW-6 (Figures 2-6a) were stable in 2009, with an increase of less than one foot between June and October. The water levels in RMW-7 increased between September 2008 and June 2009 (Figure 2-7a). The water levels then decreased approximately five feet in the remainder of 2009. This trend is similar to that seen in 2008.

### **2.2 Water Quality**

Water quality samples were collected from seven ground water sampling sites in June, August, and October 2009. Water quality data for select constituents for all current sample sites are provided in Tables 2-1 through 2-2. A table of all analytical and water level data for all locations sampled in 2009 are provided in Appendix A. Cobalt and copper reporting limits were increased in 2009 in an effort to utilize reporting limits that were protective of the environment while providing reliable data.

#### **2.2.1 BFMW-1**

Sulfate and hardness concentrations were constant in 2009 (Figure 2-1a) with no visible historic trend. Total dissolved solids (TDS) were consistent in the spring/summer events, with an approximate 50% decrease during the fall event. Dissolved and total recoverable

cobalt concentrations were not reported above the reporting limit (0.006 mg/L) in 2009 (Figure 2-1b). Dissolved and total recoverable copper concentrations were relatively consistent in 2009 with no historic trend visible. Total suspended solids (TSS) concentrations have been at or below detection limits since 2006 (Figure 2-1c).

### **2.2.2 BFMW-3**

Sulfate concentrations were stable in 2009 and one mg/L lower than in 2008. Hardness concentrations were stable in 2009; with no historic trend visible (Figure 2-2a). TDS concentrations decreased between September 2008 and June 2009 and then increased the remainder of 2009, exhibiting a trend similar to that seen in 2007 and 2008. Dissolved and total recoverable cobalt concentrations increased slightly in 2009, compared to respective concentrations in 2007 and 2008 (Figure 2-2b). Dissolved and total recoverable copper concentrations increased between September 2008 and June 2009 and then decreased the remainder of 2009. This trend is similar to that seen in 2007 and 2008.

### **2.2.3 BFMW-4d**

Sulfate was reported at 1 mg/L in all samples collected in 2008 and 2009 (Figure 2-3a). Hardness and TDS concentrations decreased between 2008 and 2009 and remained constant in 2009. Dissolved and total recoverable cobalt concentrations were not reported above the reporting limit (0.006 mg/L) in 2009 (Figure 2-3b). Dissolved and total recoverable copper concentrations increased between September 2008 and August 2009, and then decreased in October 2009. TSS concentrations have been below reporting limits since 2006 (Figure 2-3c).

### **2.2.4 RMW-2**

Sulfate decreased from 2008 to a historic low in 2009 (Figure 2-4a). Hardness and TDS concentrations varied slightly in 2009. These values are consistent with the historic variability of these analytes in this well. Dissolved and total recoverable cobalt concentrations were not reported above the reporting limit (0.006 mg/L) in 2009 (Figure 2-4b). Dissolved and total recoverable copper remained consistent with historic

concentrations. TSS concentrations have been below reporting limits since 2005 (Figure 2-4c).

### **2.2.5 RMW-3**

Sulfate concentrations decreased to a historic low in 2009 (Figure 2-5a). Hardness and TDS concentrations varied slightly in 2009 and the concentrations were similar to those measured in 2005 through 2008. Dissolved and total recoverable copper and cobalt concentrations remained constant with little variability in 2009 (Figures 2-5b), and the concentrations were similar to those reported since late 2005. TSS concentrations have been below or close to reporting limits since 2006 (Figures 2-5c).

### **2.2.6 RMW-6**

Sulfate concentrations decreased to a historic low in 2009 (Figure 2-6a). Hardness concentrations exhibited a steady increase in 2009, but remained within the historic range of concentrations measured at this well. TDS concentrations decreased steadily from September 2008 through 2009, but remained within the historic range of concentrations measured at this well. Reported total recoverable cobalt and dissolved copper concentrations were relatively stable in 2009 (Figures 2-6b). Dissolved cobalt increased in 2009 but reported concentrations were within historic variability. Total recoverable copper increased in 2009. This increase is part of an increasing trend since 2008.

### **2.2.7 RMW-7**

Sulfate concentrations in 2009 continued the historic trend of decline from the 2007 concentrations. Hardness concentrations fluctuated in 2009 and were below the concentrations exhibited in 2007 and 2008. TDS concentrations decreased between September 2008 and June 2009 and then increased in the remaining samples of 2009, similar to the trend seen in 2008. Dissolved and total recoverable copper and cobalt concentrations fluctuated slightly in 2009, but remained within the historic range of concentrations measured at this well (Figures 2-7b).

## **3.0 SURFACE WATER REVIEW**

### **3.1 Flow**

Spring and summer flows on Panther Creek (WQ-3 and WQ-25) were not measured due to high water and safety concerns. Flow during the October 2009 sampling event was measured at both Panther Creek monitoring sites and was within the historic range of low flows at each respective site.

Spring (May and June) high flows on Big Deer Creek were measured at WQ-23 (only May), WQ-24a, and WQ-30, but were not measured at WQ-28 due to high water and safety concerns. The flows were all within the historic range for each time period and respective site, with the exception of WQ-30 which only has three years of record, and this year the measured flows were higher than in 2007 or 2008 (although the peak flow from 2008 does not appear to have been captured at this site, based on the flow measured at WQ-24a in 2008). The summer (August) and fall (October) flows for each site were all within the historic range for each time period and respective site.

Spring, summer, and fall flows on South Fork Big Deer Creek (WQ-20 and WQ-22) were all within the historic range for each time period and respective site.

Spring, summer, and fall flows on lower Bucktail Creek (WQ-19, WQ-21, and WQ-29) were all within the historic range for each time period and site. Spring and summer (May and June) flows at WQ-18 were higher than the historic range, but spring/summer flows have not been measured at this site in the last four years. The fall (October) flow measured at WQ-18 was within the historic range. Only fall (October) flow was measured at WQ-17, and was within the historic range for this site. No flow was measured at WQ-16 in 2009.

Spring, summer, and fall flows were measured in Ram Gulch (WQ-10). Flow during the May 2009 sampling event was slightly higher than the peak May flow in 2008, and the remainder of the flow measurements followed the historic trend.

## **3.2 Water Quality**

Water quality samples were collected from 15 surface water sampling sites in May, June, August, and October 2009. Water quality data for select constituents are provided in Table 3-1. Appendix A lists results of all constituents analyzed as specified in the 2008 Monitoring Plan.

### **3.2.1 WQ-3**

Sulfate and hardness concentrations decreased from September 2008 to May 2009 and increased the remainder of 2009, similar to the historic trend (Figure 3-1a). TDS concentrations have fluctuated since 2004 with no visible trend. Dissolved cobalt concentrations decreased from September 2008 to May 2009, and increased the remainder of 2009, similar to the historic trend. Total recoverable cobalt, dissolved copper, and total recoverable copper concentrations increased between late 2007 and 2008, to reach historic highs in May 2008, and increased again between late 2008 and May 2009 (Figure 3-1b). The elevated concentrations of dissolved copper and total recoverable copper and cobalt in May 2009 coincide with elevated TSS concentrations. Reported concentrations decreased to within historic range of values for these constituents in the remainder of 2009.

### **3.2.2 WQ-10**

Sulfate and TDS concentrations fluctuated in 2009, within the historic variability at this sampling site (Figure 3-2a). Hardness concentrations exhibited a historic low in May 2009 but increased to within the historic range of values the remainder of 2009. Dissolved and total recoverable cobalt and copper concentrations fluctuated in 2009, but most were within the range of historic values (Figure 3-2b). The dissolved and total recoverable cobalt concentrations reported in the sample collected in May 2009 were historic low values.

### **3.2.3 WQ-16**

The historic trends of hardness, TDS, and sulfate are similar (Figure 3-3a). High concentrations were measured in August 2002 and concentrations decreased in the samples collected through 2005. Concentrations increased between 2005 and 2007, decreased to historic lows by May 2009, and increased in late 2009. Dissolved cobalt and copper concentrations exhibit similar historic trends (Figure 3-3b), where concentrations have decreased between May 2008 and June 2009. Total recoverable cobalt and copper concentrations were reported at historic high values in May 2009 but then returned to near historic levels in the June sample.

### **3.2.4 WQ-17**

The historic trends of hardness, TDS, and sulfate are similar (Figure 3-4a). Concentrations of all three analytes exhibited a consistent average trend since 2006. Most of these measurements were within the historic range of concentrations measured at this monitoring location, with the exception of the hardness value on May 2009, which was a historic low value. Dissolved and total recoverable cobalt and copper concentrations exhibited similar trends (Figure 3-4b), and were within the range of historic variation.

### **3.2.5 WQ-18**

Hardness, TDS, and sulfate exhibited historic lows in late May 2009 (Figure 3-5a). This historic low coincided with a historic high flow measurement. Concentrations of these constituents increased as the flow decreased through 2009. Concentrations of total recoverable and dissolved cobalt and copper have fluctuated historically but since 2005, the general trend is toward decreasing concentrations (Figure 3-5b), with the exception of the slightly elevated total recoverable cobalt and copper concentrations in the May 2009 sample.

### **3.2.6 WQ-19**

Hardness, sulfate, and TDS concentrations fluctuated in 2009 within the range of historic concentrations (Figure 3-6a). Dissolved and total recoverable cobalt and copper concentrations were relatively stable in 2009 (Figure 3-6b). The historic trend of these parameters is toward decreasing concentrations.

### **3.2.7 WQ-20**

Reported sulfate and hardness concentrations decreased between September 2008 and May 2009 then increased through 2009, with the exception of the decrease in sulfate concentration in the October 2009 sample (Figure 3-7a). Reported TDS concentrations increased slightly between September 2008 and May 2009, then decreased between May 2009 and June 2009, and increased the remainder of 2009. The fluctuations in these parameters appear to coincide with the flow, where lower concentrations are reported at higher flows. These fluctuations are similar to those seen in 2007 and 2008. The dissolved cobalt concentrations were not reported above reporting limits (Figure 3-7b). Total recoverable cobalt concentrations in 2009 were not reported above the reporting limits after the May 2009 sample. Dissolved copper concentrations were stable in 2009 and are within the range of historic concentrations. The reported total recoverable copper concentration in May 2009 was a historic high value; approximately twice the previous high reported value in 2008. The late spring, summer, and fall total recoverable concentrations were within normal historic range of values.

### **3.2.8 WQ-21**

Sulfate, hardness, and TDS concentrations fluctuated in 2009, with historic low values, for sulfate and hardness, during the May sampling event (Figure 3-8a). The general trend appears to be decreasing for these constituents. Dissolved and total recoverable cobalt and dissolved copper concentrations fluctuated in 2009 (Figure 3-8b), with an overall trend of decreasing concentrations. Total recoverable copper exhibited an increased concentration early in the spring then concentrations declined to within the range of historic values similar to 2007 and 2008.

### **3.2.9 WQ-22**

Hardness concentrations decreased between September 2008 and May 2009 and then increased during the remainder of the year (Figure 3-9a). Similarly, sulfate concentrations decreased between September 2008 and June 2009 and then increased during the remainder of the year. Reported sulfate concentrations followed the historic trend, but decreased to historic low values in May and June 2009. Dissolved cobalt concentrations fluctuated in 2009, and followed a similar trend as the 2007 and 2008 results (Figure 3-9b). Total recoverable cobalt and dissolved copper fluctuated in 2009, and reached historic low values in the June 2009 sample. Total recoverable copper fluctuated similar to 2008 results, with an elevated May 2009 value.

### **3.2.10 WQ-23**

Reported sulfate, TDS, and hardness concentrations fluctuated in 2009 (Figure 3-10a). These concentrations decreased from 2008 to June 2009 and then increased in samples collected later in 2009. Reported TDS concentrations from the sample collected in May 2009 were below historic concentrations and the concentrations reported in the October 2009 sample were above historic concentrations. Dissolved and total recoverable cobalt and dissolved copper concentration values did not exceed the reporting limits in 2009 (Figure 3-10b). Total recoverable copper concentration in May 2009 exceeded the reporting limit, but concentrations the rest of the year did not exceed the limit.

### **3.2.11 WQ-24a**

Sampling location WQ-24a was added to the monitoring plan in 2005 to obtain a sampling location more representative of a fully mixed stream below the confluence of Big Deer Creek and South Fork Big Deer Creek. Sampling location WQ-24 was not sampled after 2005.

Reported hardness, TDS and sulfate concentrations fluctuated within historic values in 2009 (Figure 3-11a). No long term trends were visible. Dissolved and total recoverable cobalt and dissolved copper concentrations fluctuated within historic values (Figure 3-11b), with the exception of a historic low dissolved copper value on June 2009.

### **3.2.12 WQ-25**

Reported hardness and sulfate concentrations decreased between September 2008 and May 2009, with historic low values reported in the May 2009 sample (Figure 3-12a). TDS concentrations fluctuated within historic limits in 2009. Dissolved and total recoverable copper and cobalt concentrations fluctuated within historic limits in 2009 (Figure 3-12b), with elevated May 2009 concentrations of total recoverable cobalt, dissolved copper and total recoverable copper.

### **3.2.13 WQ-28**

Sulfate concentration decreased to below historic values in May 2009, but the samples collected later in 2009 were within the historic range of values (Figure 3-13a). Reported hardness concentrations were within normal historic values in 2009. TDS concentration decreased to below historic values in June 2009, but the samples collected later in 2009 were within the historic range of values. Dissolved and total recoverable cobalt and copper concentrations fluctuated within the range of historic values in 2009 (Figure 3-13b).

### **3.2.14 WQ-29**

The BMSG (Blackbird Mine Site Group) installed a cut-off wall on Bucktail Creek downstream of WQ-18 in the winter of late 2006 and early 2007. The wall has the potential to significantly change the downstream water quality. Therefore, a new surface water sampling location (WQ-29) was established in 2007 downstream of the cut-off wall and upstream of Ram Gulch. The reported values of all selected constituents fluctuated in 2007, 2008, and 2009 (Figures 3-14a and 3-14b). Historic trends are to be determined by future sampling.

### **3.2.15 WQ-30**

WQ-30 was added to the monitoring plan in 2007 to provide data downstream of National Pollutant Discharge Elimination System (NPDES) Outfall 001. Data from this location and WQ-24a, which is upstream of the proposed outfall, will document any

potential changes in water quality from proposed NPDES discharge. Three samples were collected at this site in 2007 and 2008, and four samples were collected in 2009. The reported values of all selected constituents fluctuated in the three years sampled (Figures 3-15a and 31-5b). Historic trends are to be determined by future sampling.

### **3.3 Bucktail Creek and South Fork Big Deer Creek Downstream Water Quality**

In an effort to understand the water quality in Bucktail Creek and South Fork Big Deer Creek, data were reviewed from monitoring sites starting in upper Bucktail Creek at WQ-17 and going downstream on Bucktail Creek to WQ-18, WQ-29, WQ-19, WQ-21, and South Fork Big Deer Creek at WQ-22 (Figure 1-1). Data from 2001 through 2009 were graphed (Figures 3-16a and 3-16b). Data graphed from 2001-2004 include May and June sampling events, while data graphed from 2005-2009 include September and October sampling events (with the exception of sampling location WQ-17 which was only sampled in May of 2005).

Flow increases downstream from WQ-17 for all years on record (Figure 3-16a), with the exception of higher flow at WQ-17 than WQ-18 in 2004 and 2005. The higher flow measured at WQ-17 in 2005 can be attributed to the fact that the flow was measured in May, a time of higher flows, and the other measurements at the other sites were collected during low flow times. Sulfate concentrations decrease downstream from WQ-17 (Figure 3-16a). Hardness concentrations increase at WQ-18 before decreasing downstream in samples collected after 2004. A slight increase in hardness occurred downstream at WQ-22 in 2007, 2008, and 2009. TDS decrease downstream from WQ-17 in all years other than 2005, which can be attributed to sample collection at a time of higher flows while the samples from the other sites were collected during low flow times. Copper and cobalt concentrations, both dissolved and total recoverable, generally decrease downstream from high values at WQ-17 (Figure 3-16b) in 2001 through 2004. In 2005 and 2006, concentrations of these analytes are lower at WQ-18 than at WQ-19, then decrease downstream from WQ-19. In 2007, 2008, and 2009, dissolved and total recoverable cobalt increase downstream from WQ-18 to WQ-21 and then decrease at WQ-22.

Dissolved and total recoverable copper fluctuates downstream of WQ-18: increasing slightly from WQ-18 to WQ-29, then decreasing slightly from WQ-29 to WQ-19, then increasing slightly to WQ-21, and finally decreasing to WQ-22 (with the exception of the 2009 total recoverable copper concentrations, which decline downstream from WQ-29).

## Tables

## **TABLES**

**Table 2-1 BFMW Wells Ground Water Quality Select Constituents**  
 (units in mg/L unless noted)

Location	Date	Dissolved Cobalt	Dissolved Copper	Total Recoverable Cobalt	Total Recoverable Copper	Hardness	Sulfate	TDS	TSS	Depth to Water (ft)
BFMW-1	06/03/09	<0.006	0.049	<0.006	0.052	7	1	30	4	13.01
	08/11/09	<0.006	0.043	<0.006	0.047	7	1	30	4	22.27
	10/05/09	<0.006	0.049	<0.006	0.055	7	1	18	<3	43.06
BFMW-3	06/03/09	0.032	0.009	0.035	0.018	8	1	17	<3	30.29
	08/11/09	0.035	0.007	0.037	0.013	8	1	19	<3	31.51
	10/05/09	0.036	0.006	0.038	0.01	9	1	26	<3	32.12
BFMW-4d	06/03/09	<0.006	0.013	<0.006	0.015	11	<1	29	<3	22.39
	08/11/09	<0.006	0.018	<0.006	0.02	11	<1	24	<3	32.96
	10/05/09	<0.006	0.005	<0.006	0.011	11	<1	26	<3	43.06

**Table 2-2 RMW Wells Ground Water Quality Select Constituents**  
 (units in mg/L unless noted)

Location	Date	Dissolved Cobalt	Dissolved Copper	Total Recoverable Cobalt	Total Recoverable Copper	Hardness	Sulfate	TDS	TSS	Depth to Water (ft)
RMW-2	06/01/09	<0.006	0.003	<0.006	0.005	118	25	149	<3	86.9
	08/10/09	<0.006	0.003	<0.006	0.004	121	25	143	<3	87.43
	10/06/09	<0.006	0.003	<0.006	0.003	120	24	141	<3	87.54
RMW-3	06/01/09	0.166	0.089	0.168	0.088	20	18	69	<3	194.26
	08/10/09	0.168	0.079	0.166	0.079	21	18	65	4	195.02
	10/06/09	0.166	0.082	0.174	0.084	20	17	58	3	195.34
RMW-6	06/01/09	0.237	0.035	0.233	0.079	20	19	68	47	166.65
	08/10/09	0.239	0.038	0.239	0.07	21	19	65	25	166.4
	10/06/09	0.246	0.034	0.233	0.094	22	18	52	58	166.27
RMW-7	06/03/09	0.072	0.034	0.072	0.034	29	20	67	<3	240.17
	08/11/09	0.077	0.034	0.075	0.035	32	23	77	<3	244.14
	10/06/09	0.076	0.037	0.078	0.037	22	22	81	<3	245.36

**Table 3-1 Surface Water Quality Select Constituents**  
(units in mg/L unless noted)

Sample	Date	Dissolved Cobalt	Dissolved Copper	Total Recoverable Cobalt	Total Recoverable Copper	Hardness	Sulfate	TDS	TSS	Flow (cfs)
WQ-3	05/20/09	0.009	0.011	0.072	0.154	17	2	65	305	TH
	06/10/09	<0.006	0.001	<0.006	0.008	17	3	44	15	TH
	08/05/09	0.008	0.001	0.008	0.002	32	5	51	<3	NM
	10/09/09	0.016	<0.001	0.014	0.001	38	10	56	<3	56
WQ-10	05/19/09	0.1	0.024	0.104	0.04	21	13	73	8	0.29
	06/09/09	0.131	0.014	0.129	0.015	28	22	66	<3	0.16
	08/04/09	0.149	0.013	0.155	0.016	32	20	73	<3	0.03
	10/08/09	0.145	0.012	0.152	0.015	30	20	66	<3	0.025
WQ-16	05/19/09	0.132	0.303	0.522	8.97	19	17	103	5390	TH
	06/09/09	0.106	0.053	0.106	0.062	74	68	131	3	TH
	08/04/09									TL
	10/08/09									TL
WQ-17	05/19/09	9.12	55.8	9.17	57.8	74	234	398	177	TH
	06/09/09	11.9	53.4	12	66.5	105	295	456	<3	TH
	08/04/09	19.4	107	19.4	105	158	460	729	<3	TL
	10/08/09	19.7	114	20.4	116	155	469	752	<3	0.0005
WQ-18	05/19/09	0.097	0.044	0.202	1.58	62	37	124	984	1.1
	06/09/09	0.1	0.095	0.114	0.126	98	86	160	17	0.3
	08/04/09	0.089	0.119	0.095	0.121	218	170	309	<3	0.034
	10/08/09	0.07	0.083	0.07	0.087	220	176	316	<3	0.0164
WQ-19	05/19/09	0.106	0.062	0.126	0.337	59	32	126	87	1.3
	06/09/09	0.114	0.056	0.115	0.083	75	57	123	8	0.56
	08/04/09	0.114	0.055	0.115	0.081	98	60	135	<3	NM
	10/08/09	0.13	0.054	0.132	0.096	92	58	141	<3	0.13
WQ-20	05/18/09	<0.006	<0.001	0.007	0.015	44	3	67	603	13
	06/08/09	<0.006	<0.001	<0.006	<0.001	47	4	55	10	17
	08/03/09	<0.006	<0.001	<0.006	<0.001	70	7	86	<3	3.2
	10/07/09	<0.006	<0.001	<0.006	<0.001	81	6	114	<3	1.8
WQ-21	05/18/09	0.092	0.1	0.105	0.426	37	17	78	48	2.2
	06/08/09	0.13	0.069	0.128	0.092	58	38	79	<3	1.3
	08/03/09	0.152	0.084	0.166	0.103	67	46	102	<3	0.45
	10/07/09	0.172	0.079	0.173	0.089	70	38	116	<3	0.3
WQ-22	05/18/09	0.012	0.019	0.03	0.166	45	5	62	188	13
	06/08/09	0.011	0.009	0.012	0.034	48	6	57	15	18
	08/03/09	0.021	0.02	0.017	0.037	71	12	85	<3	3.4
	10/07/09	0.025	0.019	0.025	0.022	79	10	112	<3	2.2
WQ-23	05/18/09	<0.006	<0.001	<0.006	0.002	13	1	48	17	108
	06/08/09	<0.006	<0.001	<0.006	<0.001	11	1	17	6	TH
	08/03/09	<0.006	<0.001	<0.006	<0.001	25	3	38	<3	14
	10/07/09	<0.006	<0.001	<0.006	<0.001	30	3	64	<3	9
WQ-24A	05/18/09	<0.006	0.004	<0.006	0.015	18	2	44	32	115
	06/08/09	<0.006	<0.001	<0.006	0.005	16	2	31	6	140
	08/03/09	<0.006	0.004	<0.006	0.006	36	5	44	<3	17
	10/07/09	0.006	0.004	<0.006	0.005	42	4	63	<3	12
WQ-25	05/20/09	0.01	0.012	0.085	0.196	16	2	57	339	TH
	06/10/09	<0.006	0.002	<0.006	0.007	17	3	44	19	TH
	08/05/09	0.007	0.001	0.008	0.002	32	5	51	<3	NM
	10/09/09	0.018	<0.001	0.02	0.002	40	11	59	5	68
WQ-28	05/20/09	<0.006	0.009	0.008	0.054	15	1	33	53	TH
	06/10/09	<0.006	0.004	<0.006	0.01	18	3	31	7	TH
	08/05/09	<0.006	0.006	<0.006	0.007	38	4	53	<3	NM
	10/09/09	0.007	0.005	<0.006	0.006	43	7	52	<3	16
WQ-29	05/19/09	0.085	0.054	0.156	1.01	70	37	125	421	1.1
	06/09/09	0.099	0.08	0.098	0.112	92	69	142	8	0.51
	08/04/09	0.09	0.091	0.092	0.112	135	83	180	<3	0.14
	10/08/09	0.085	0.087	0.098	0.098	125	80	178	<3	0.14
WQ-30	05/18/09	<0.006	0.005	<0.006	0.016	18	2	46	34	123
	06/08/09	<0.006	0.003	<0.006	0.007	16	2	26	5	147
	08/03/09	<0.006	0.005	<0.006	0.007	36	5	52	<3	18
	10/07/09	0.007	0.004	<0.006	0.007	42	4	70	<3	11

TL - flow too low/too braided to measure

NM - not measured

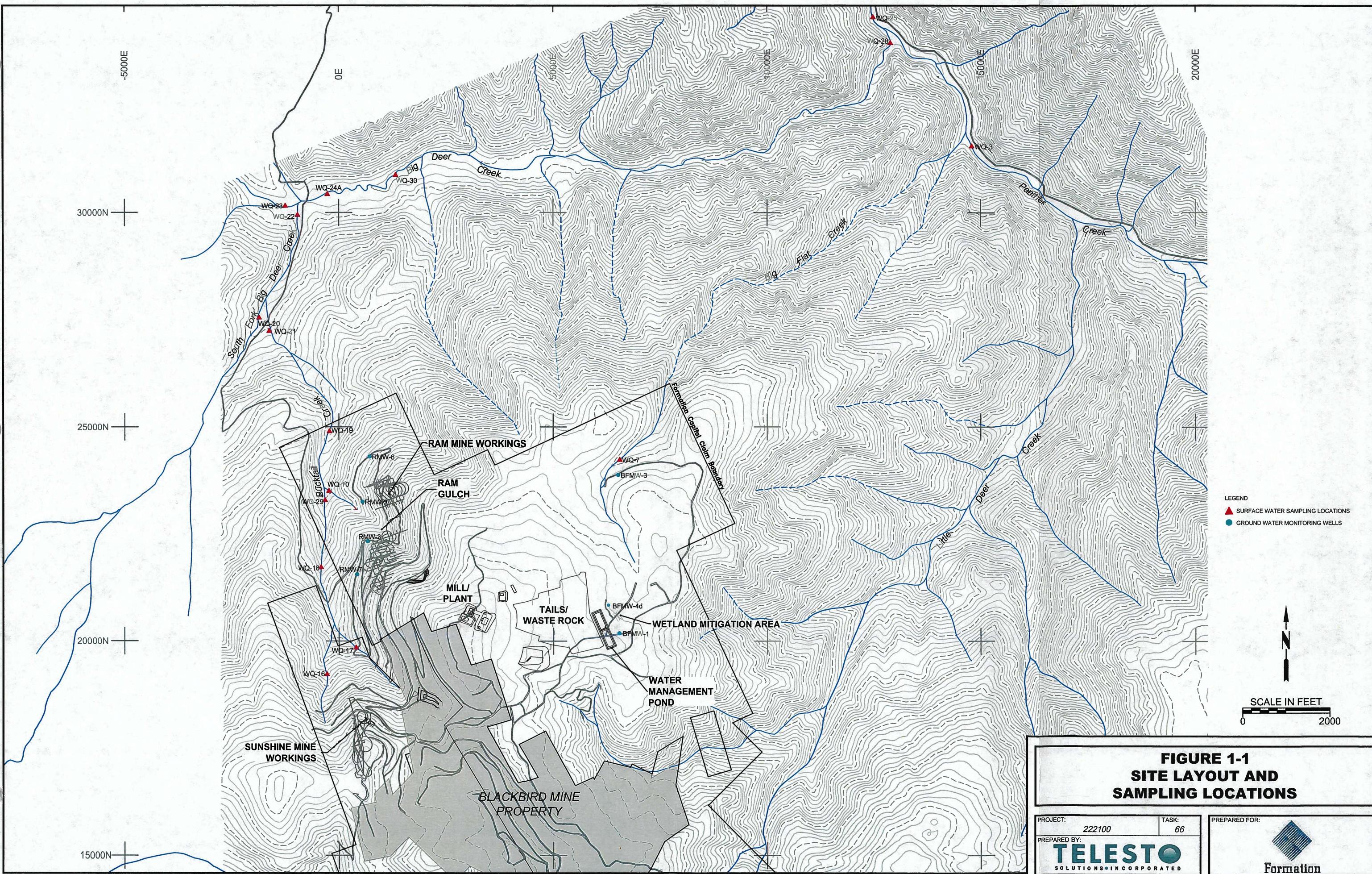
TH - too high to measure safely

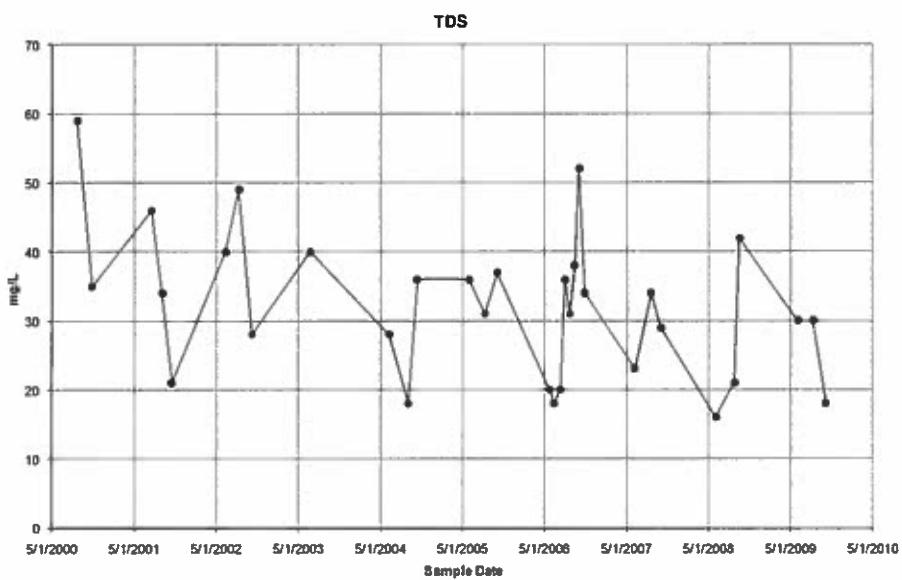
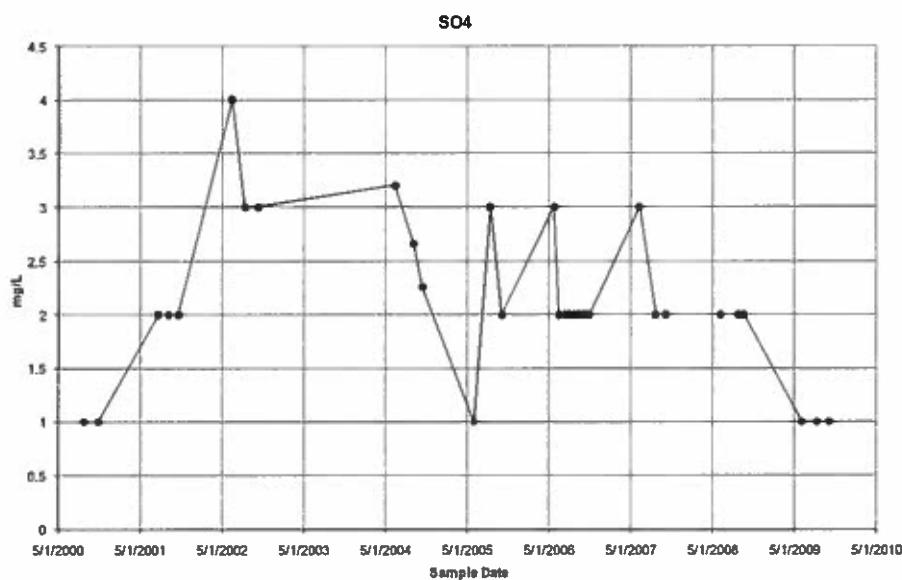
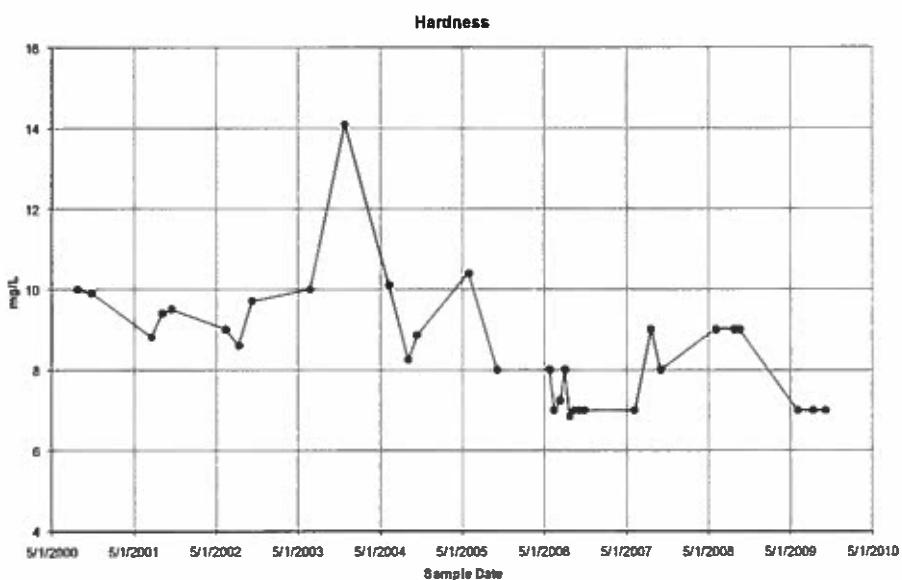
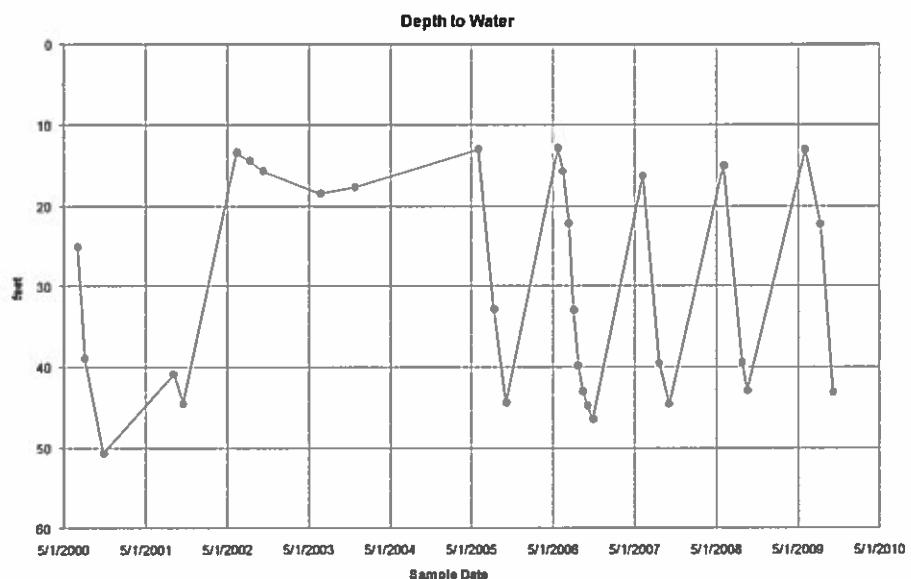
TF - no flow measured, too much flow around flume

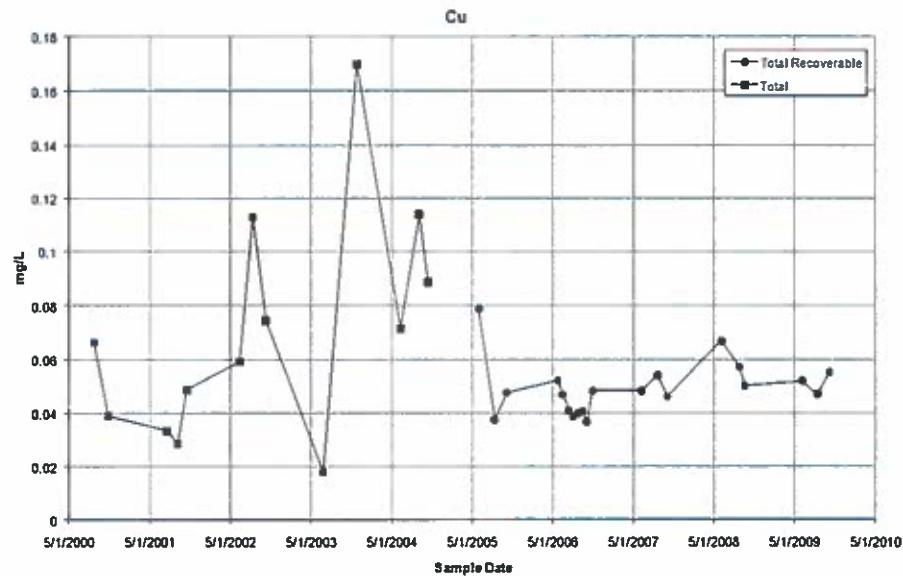
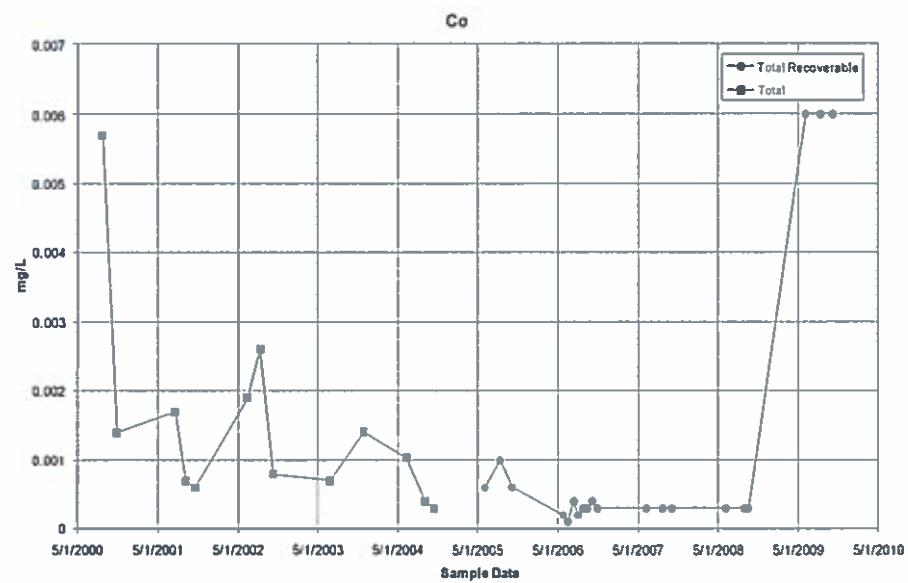
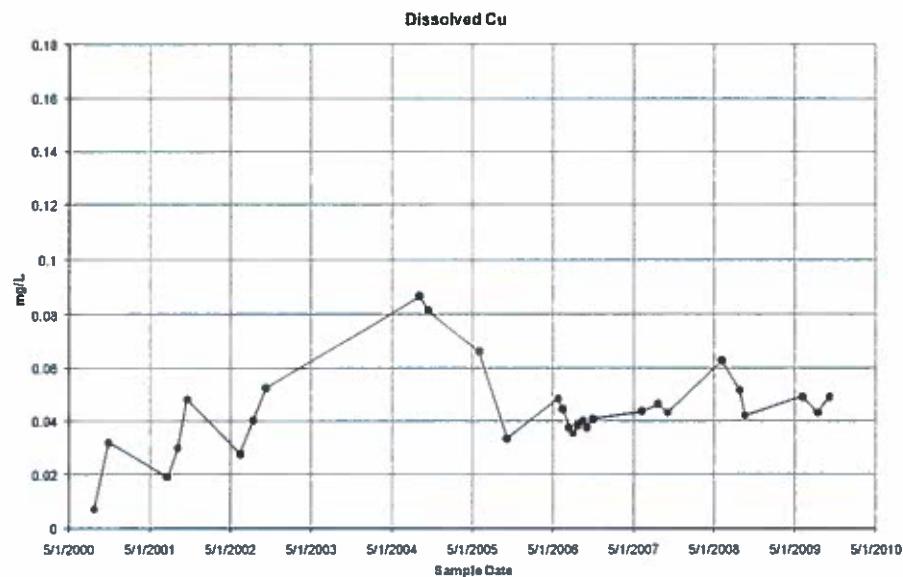
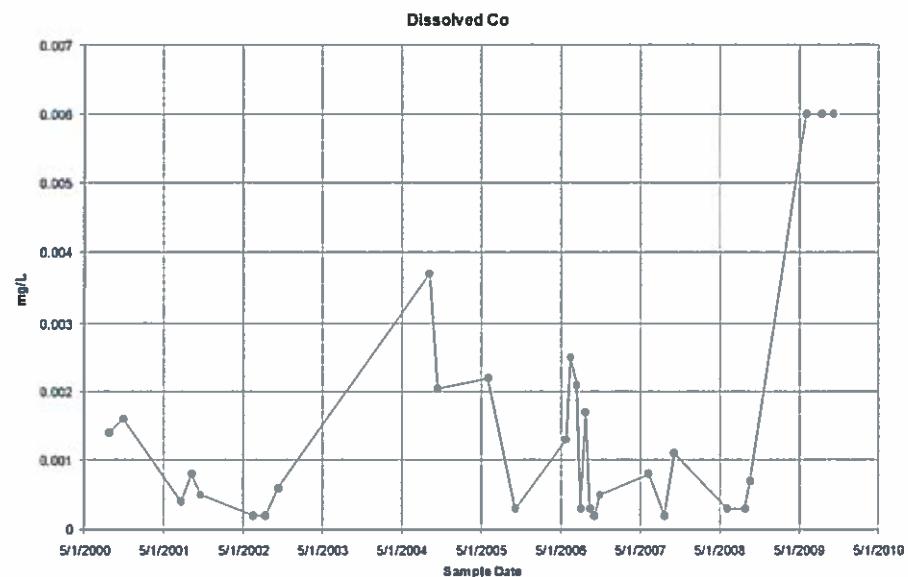
## Figures

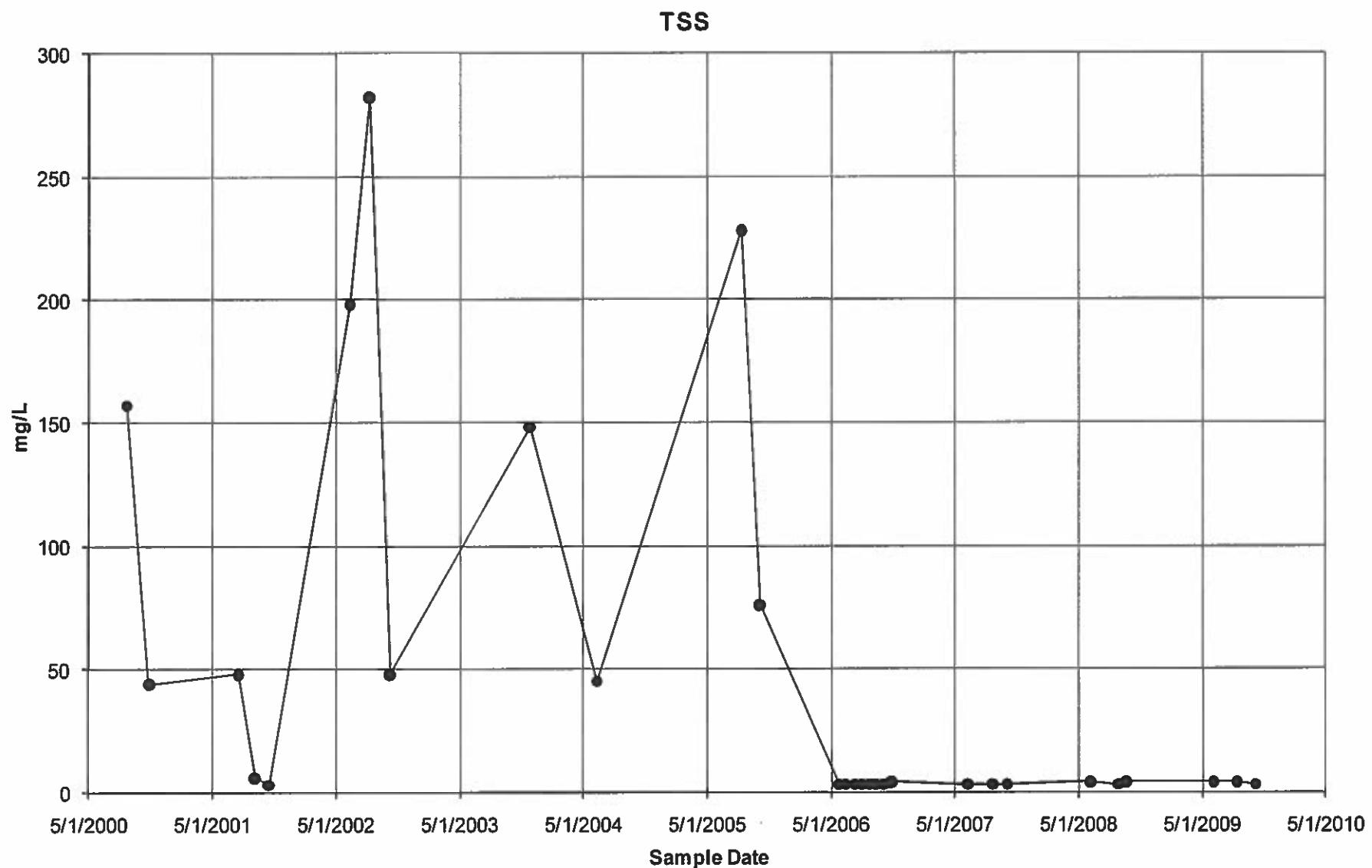


## **FIGURES**

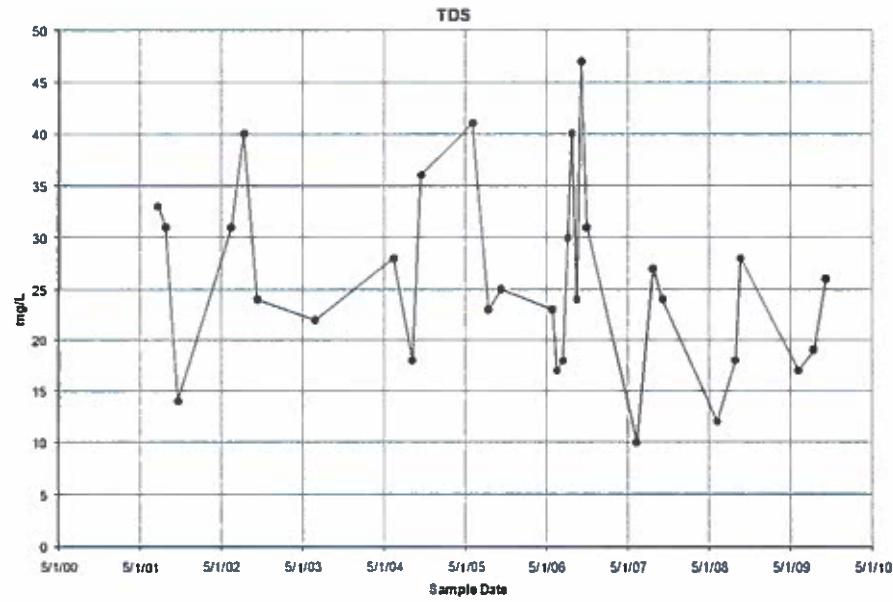
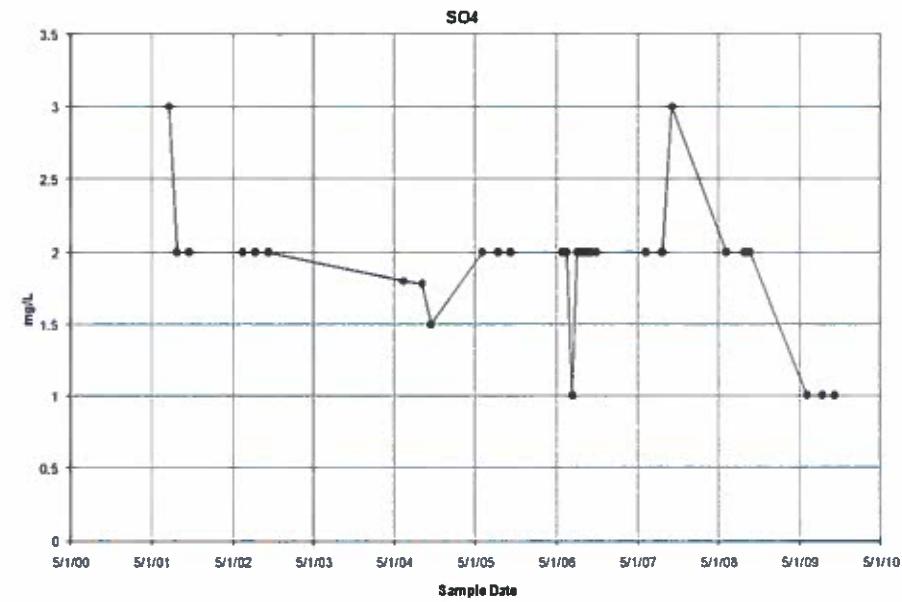
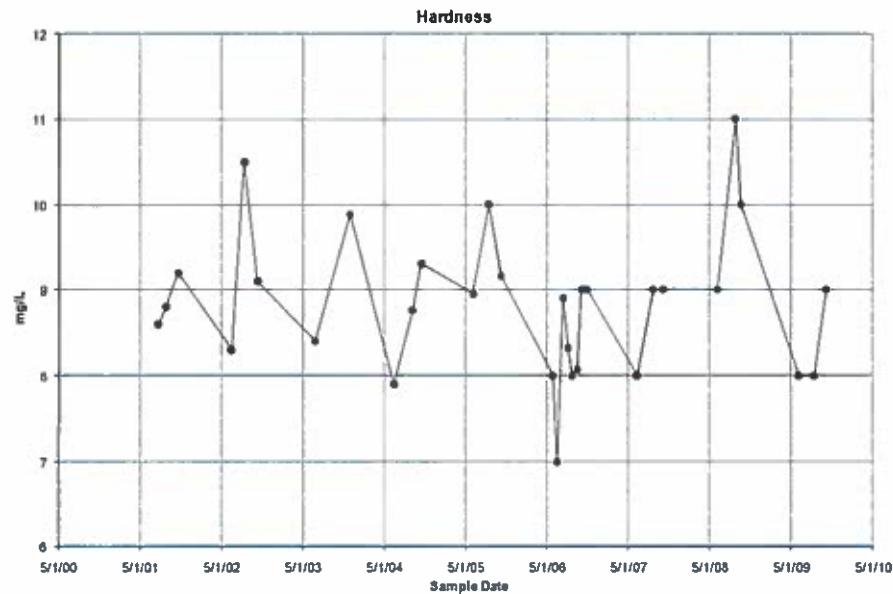
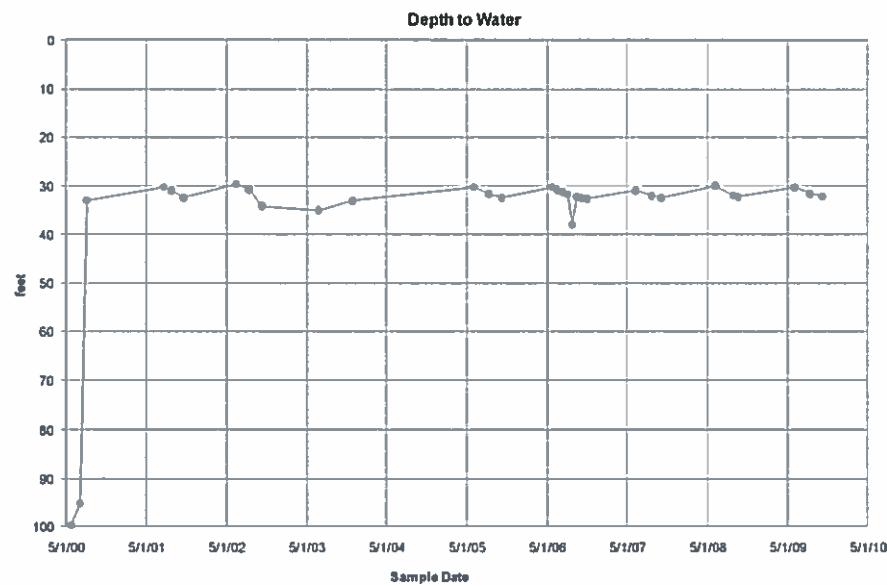


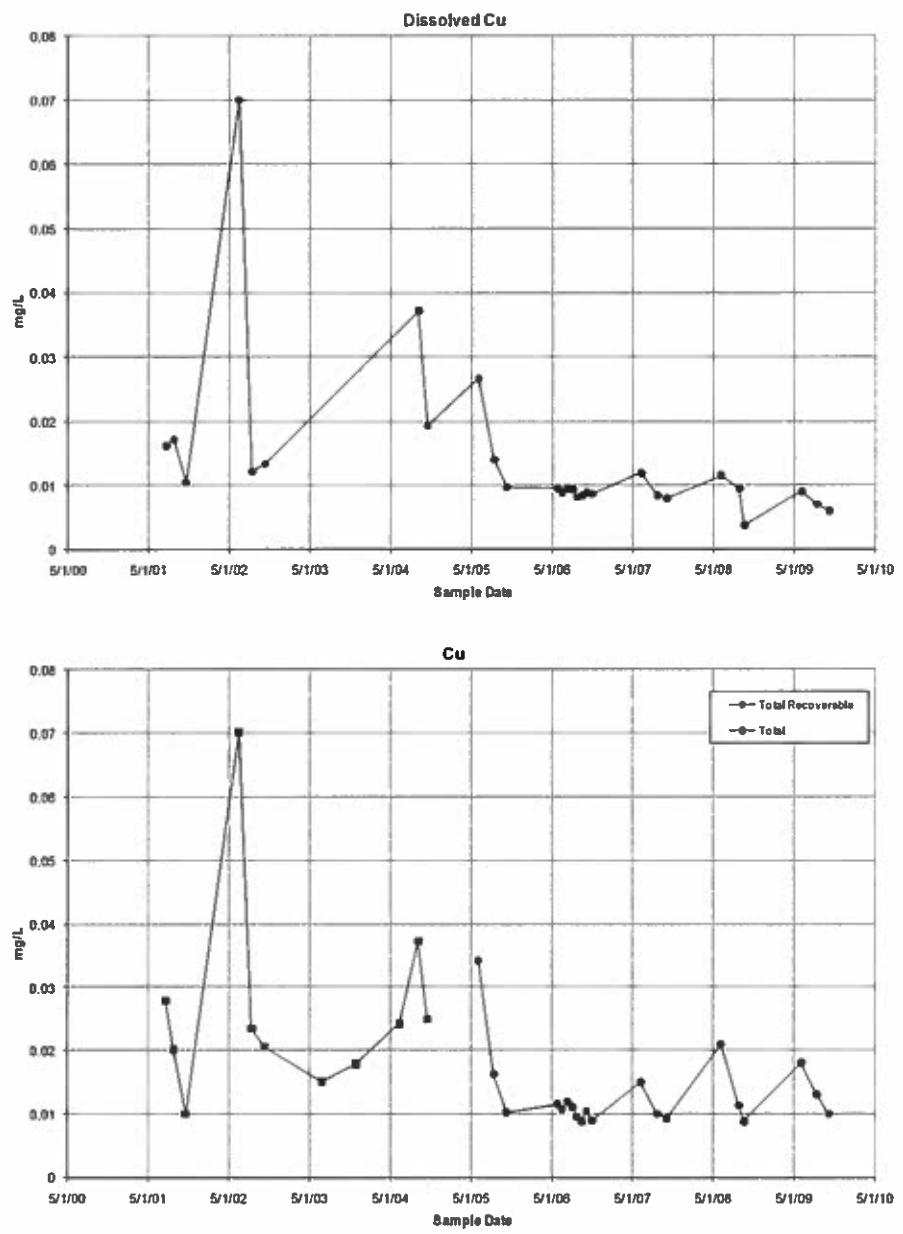
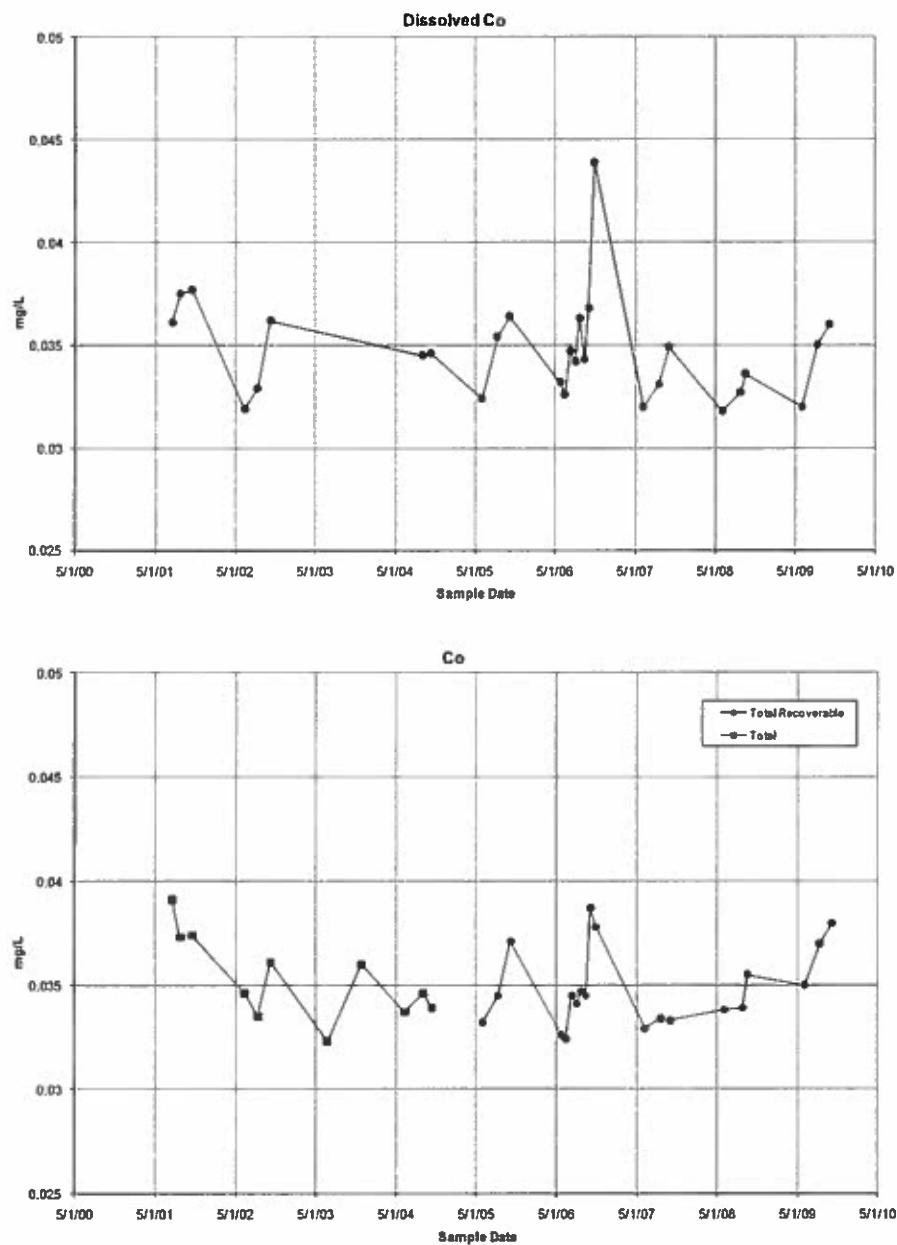


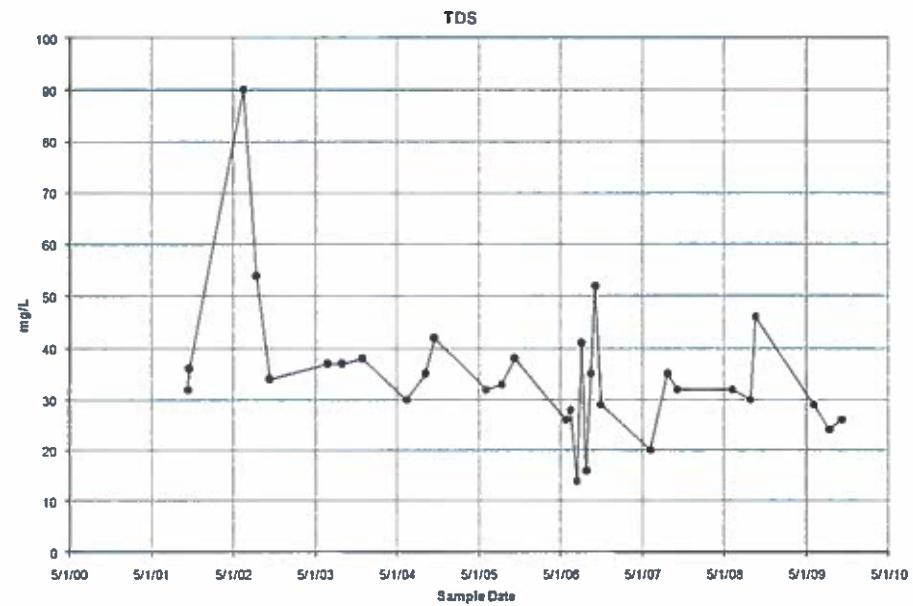
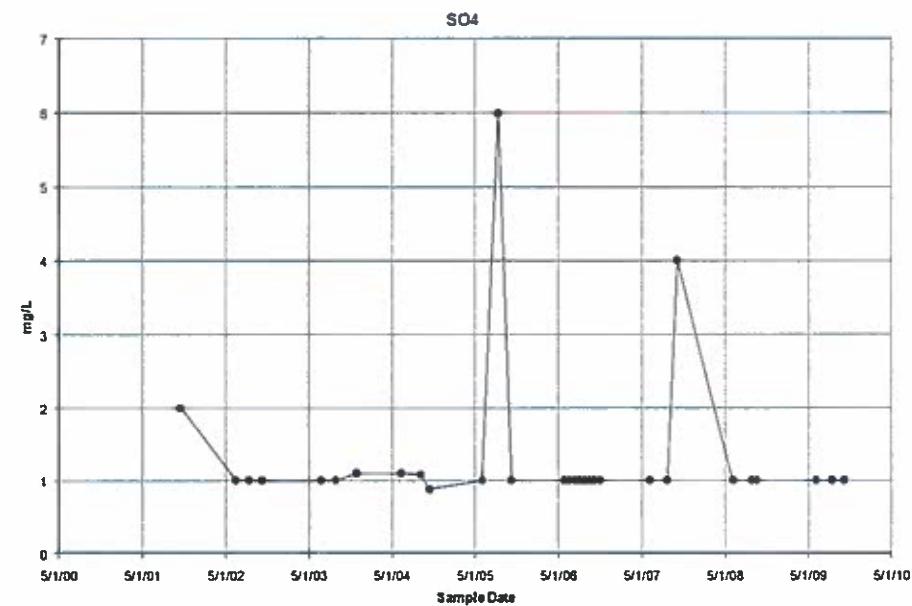
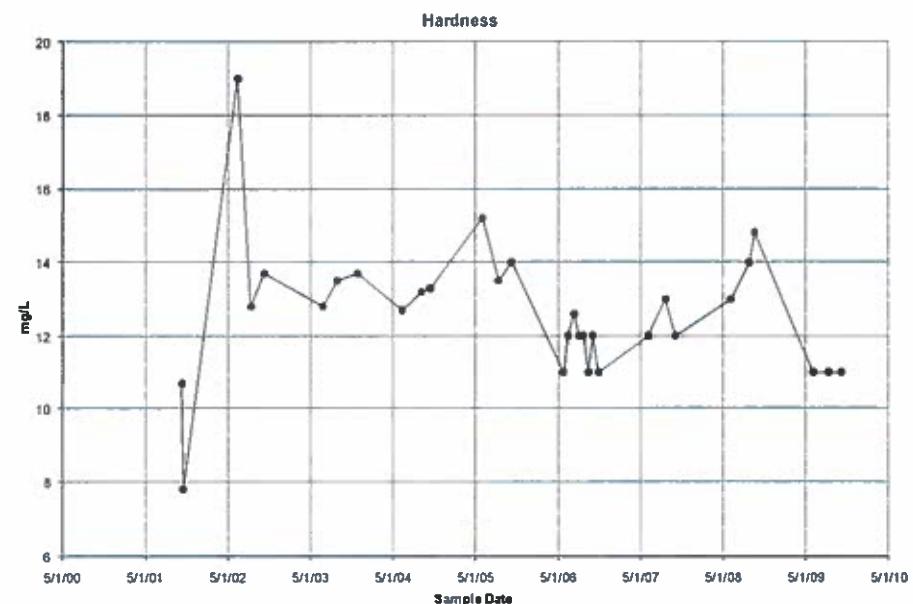
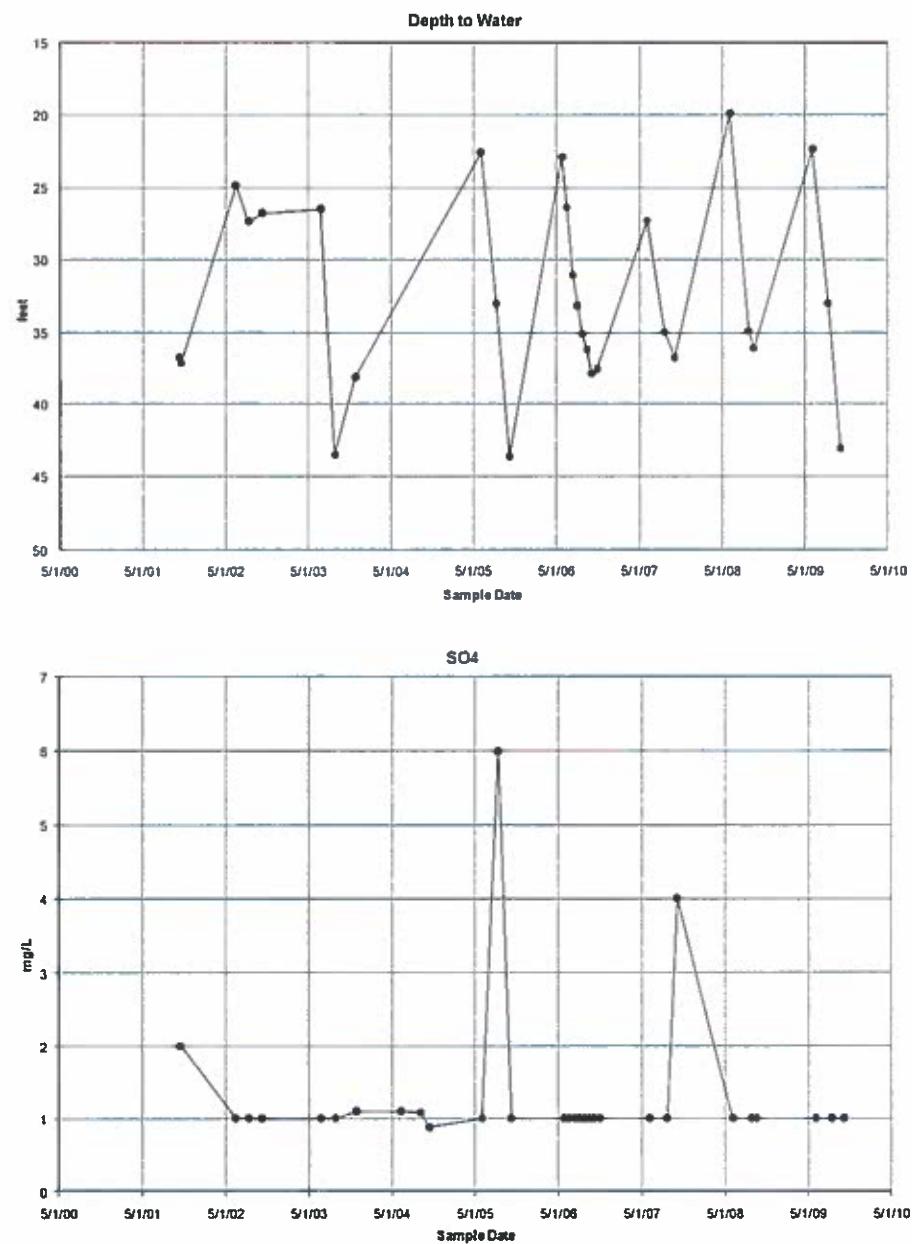


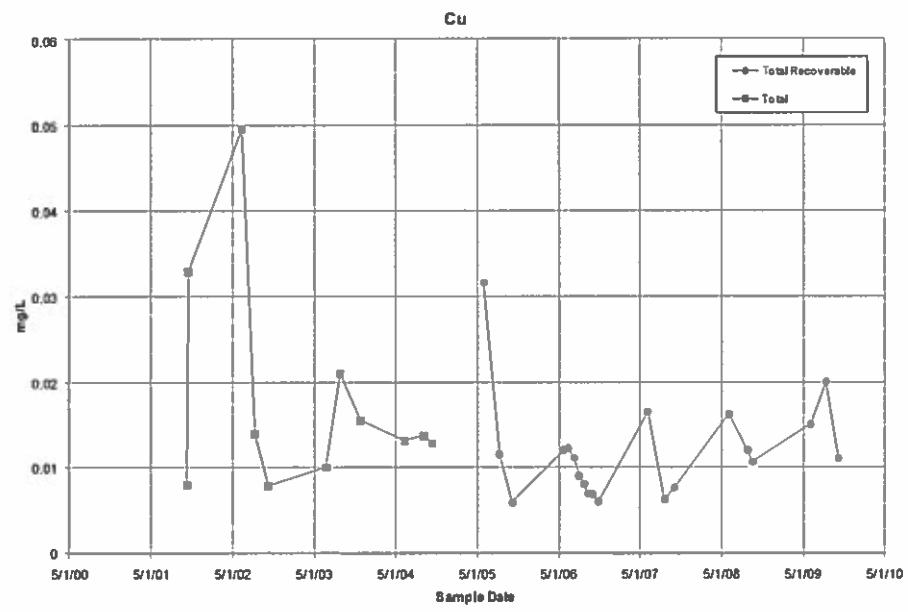
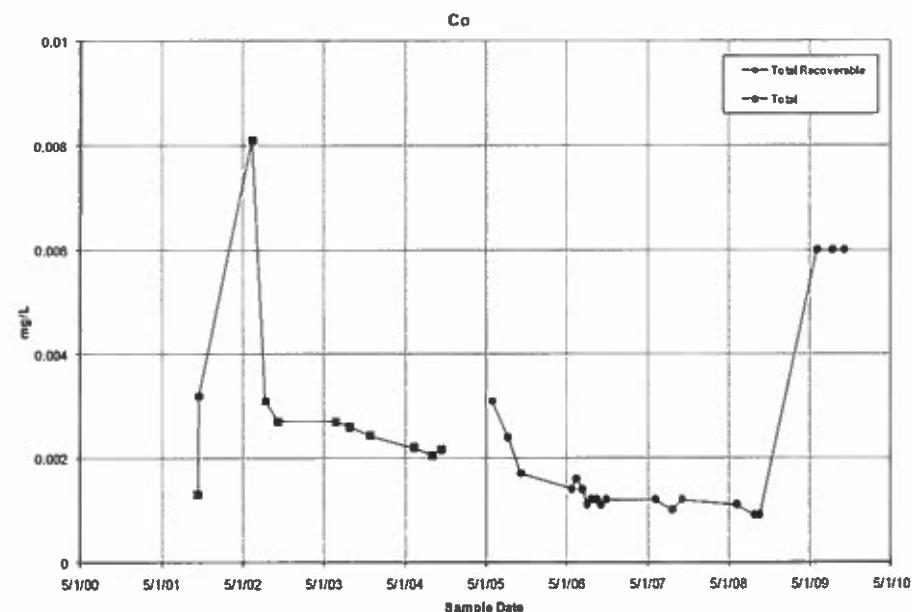
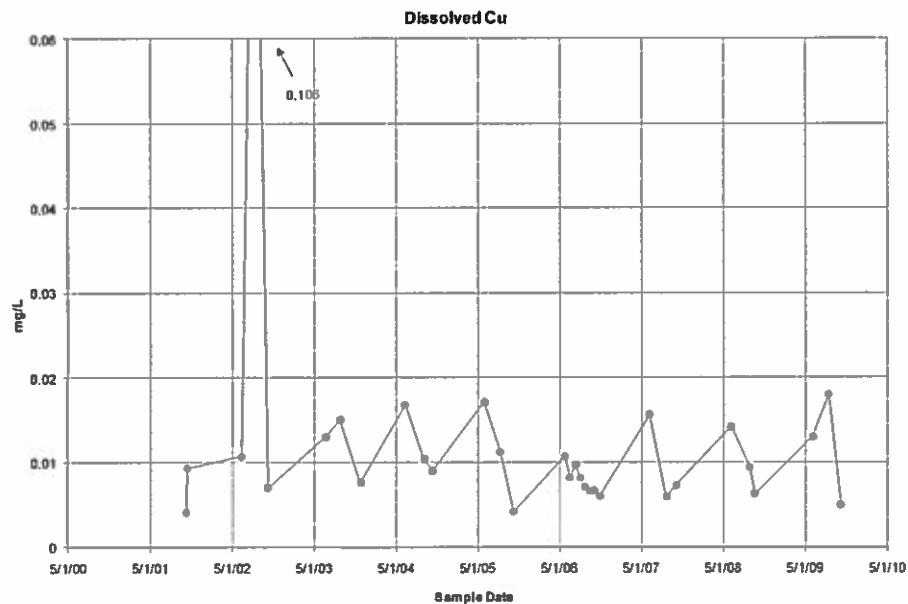
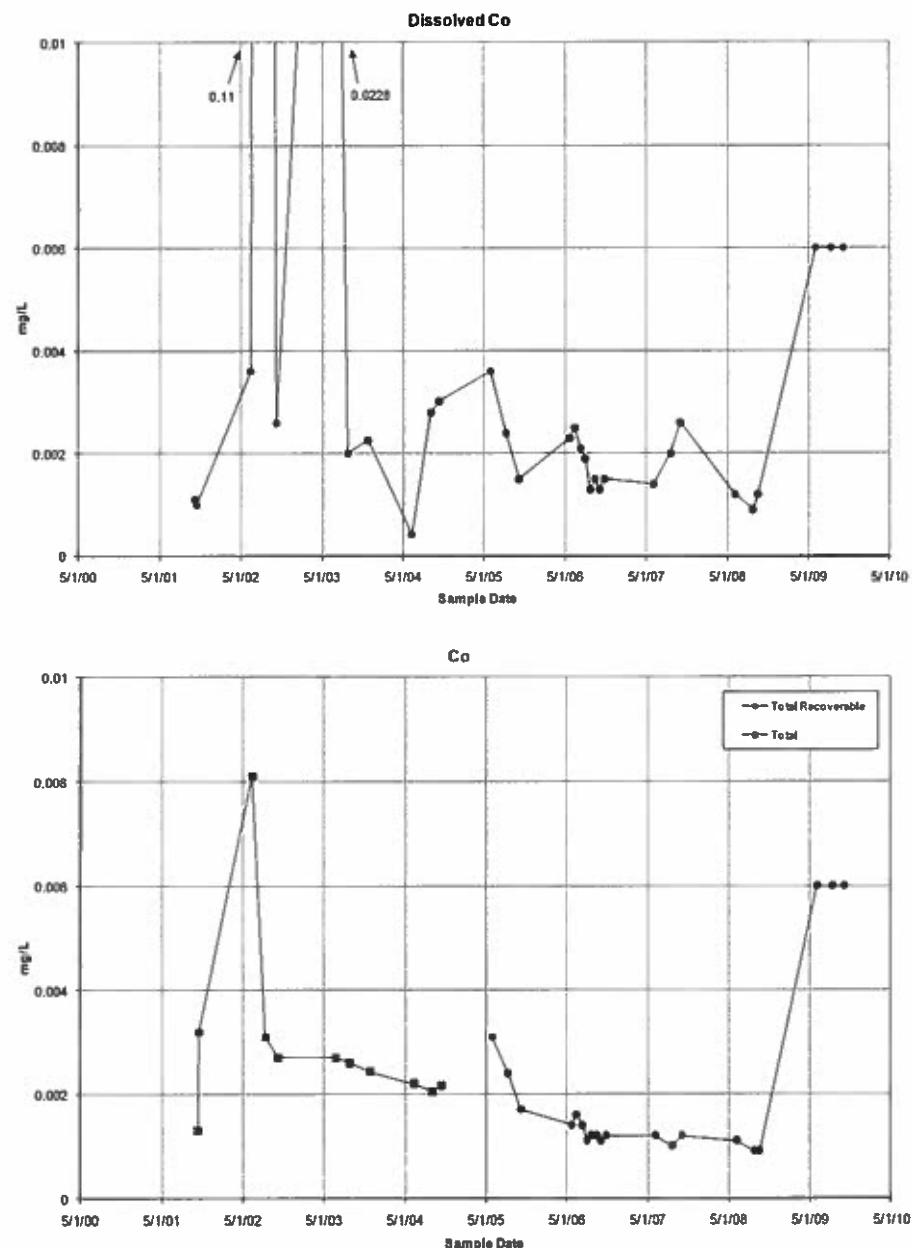


**FIGURE 2-1c**  
**2000 - 2009 DATA FOR WELL BFMW-1**

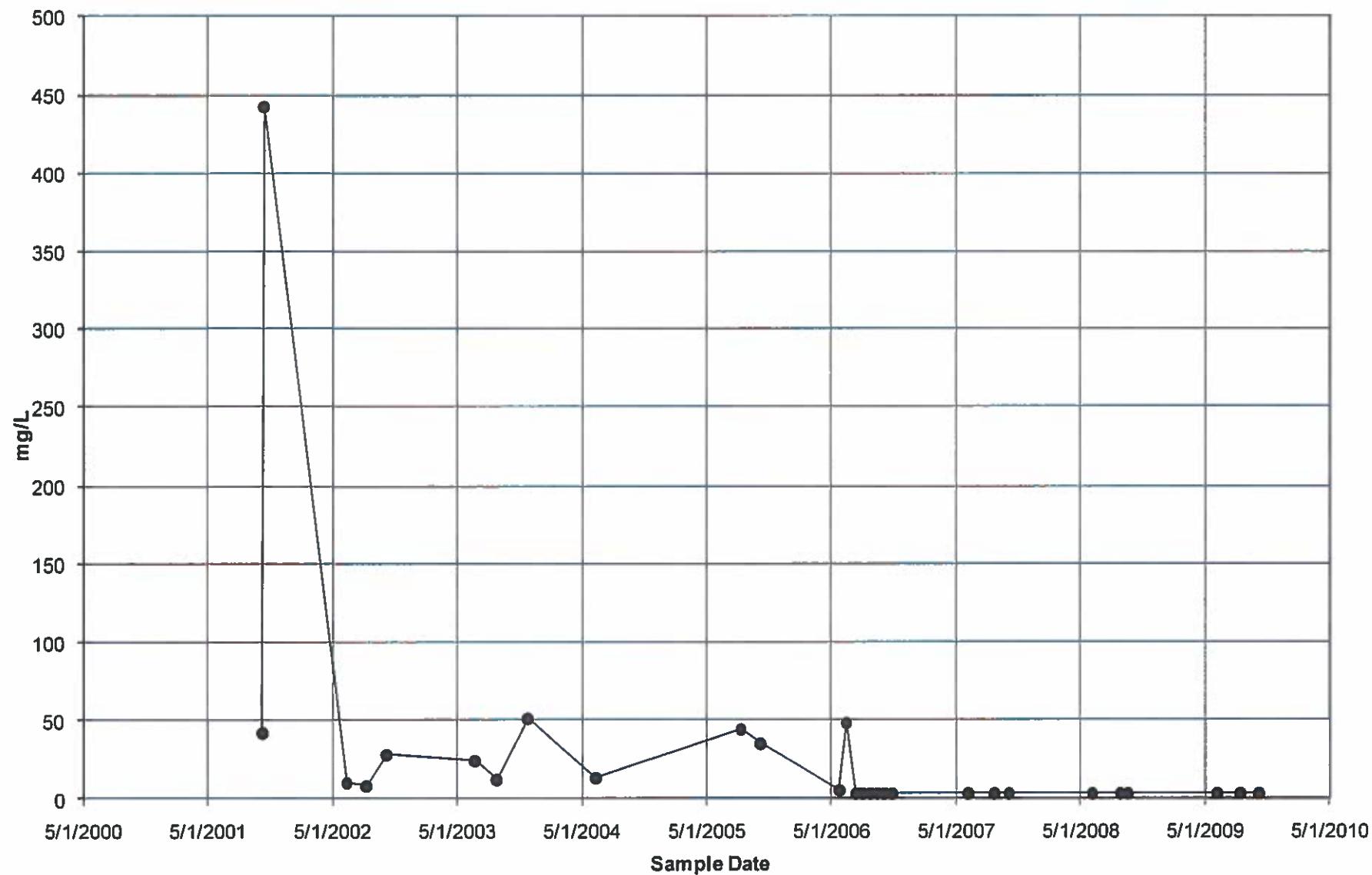


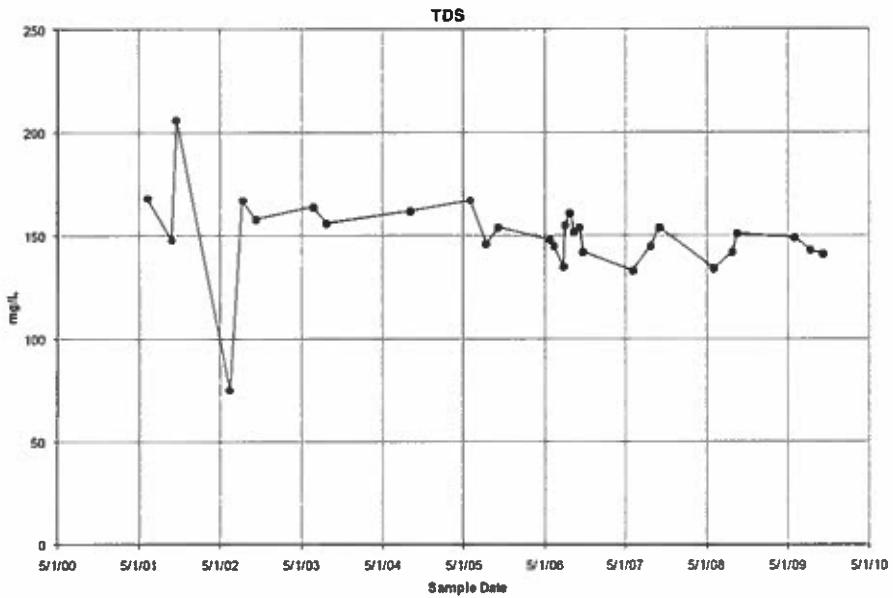
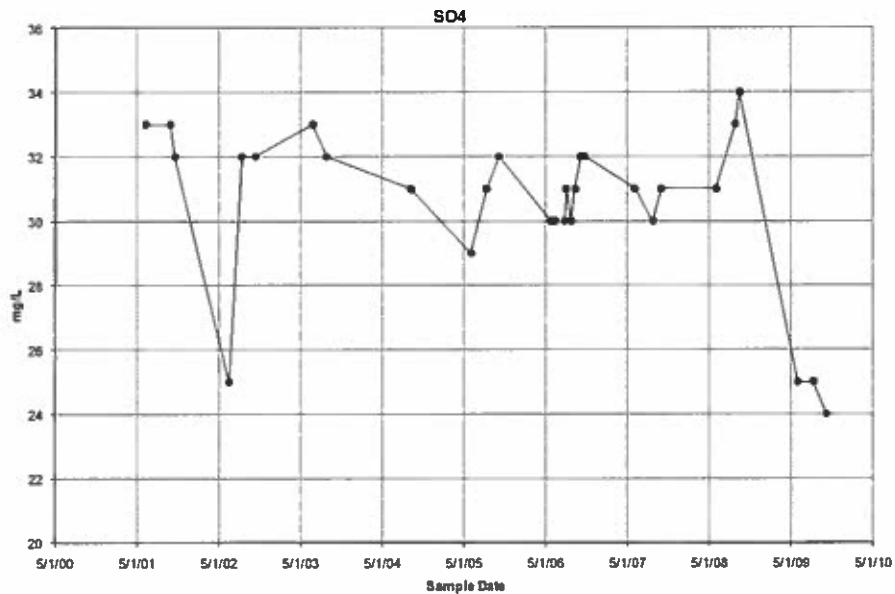
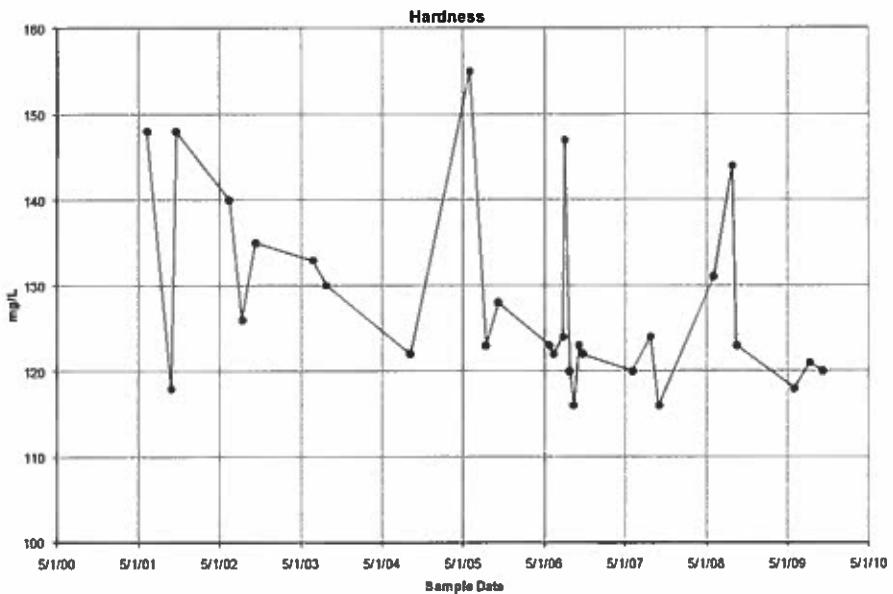
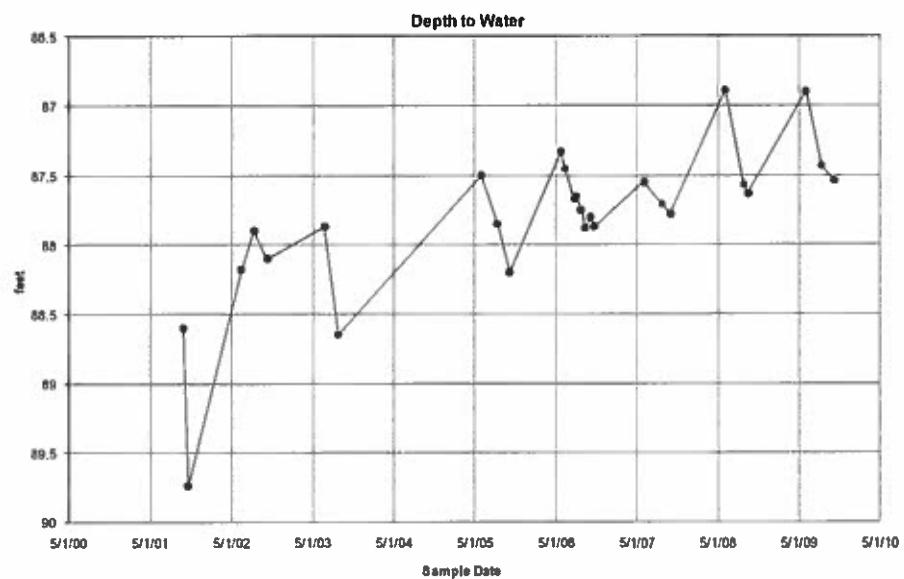


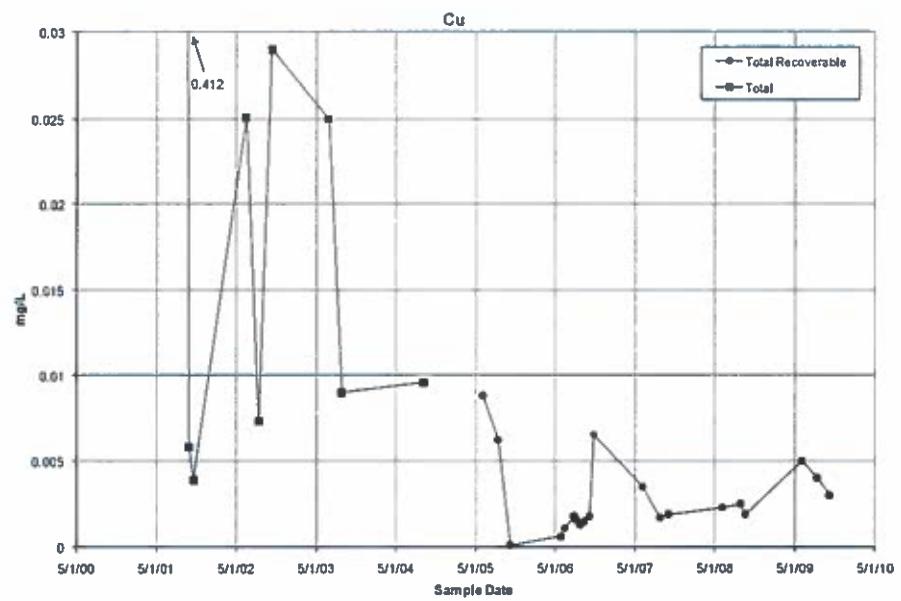
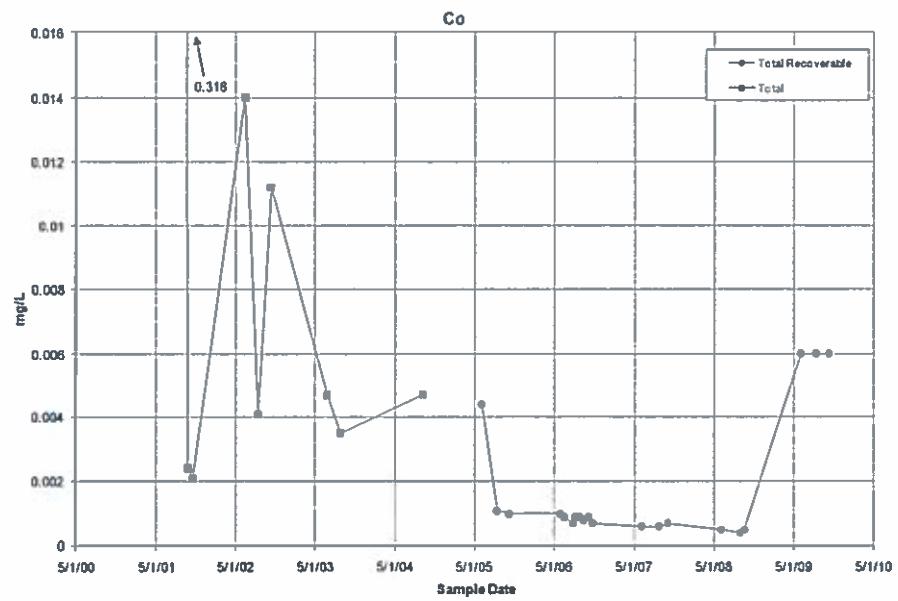
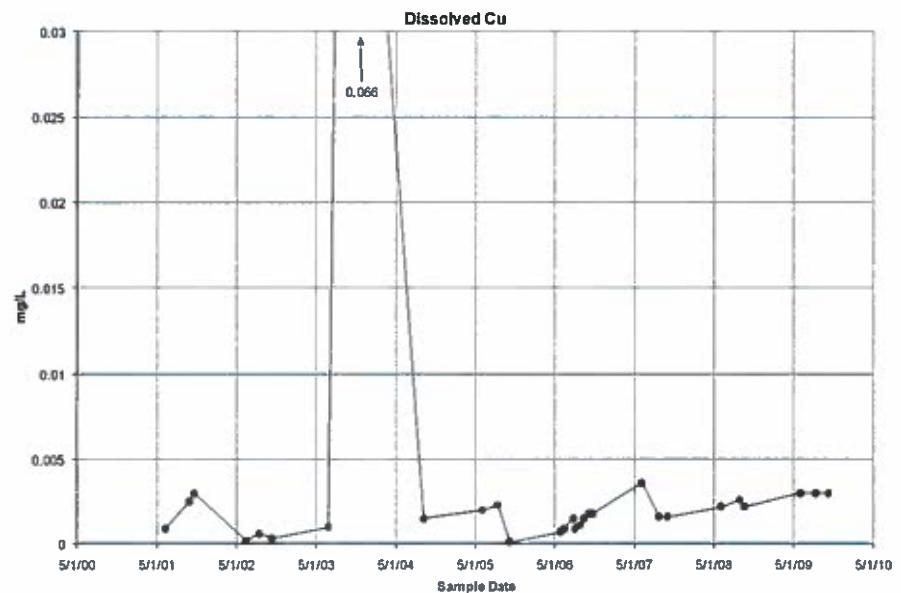
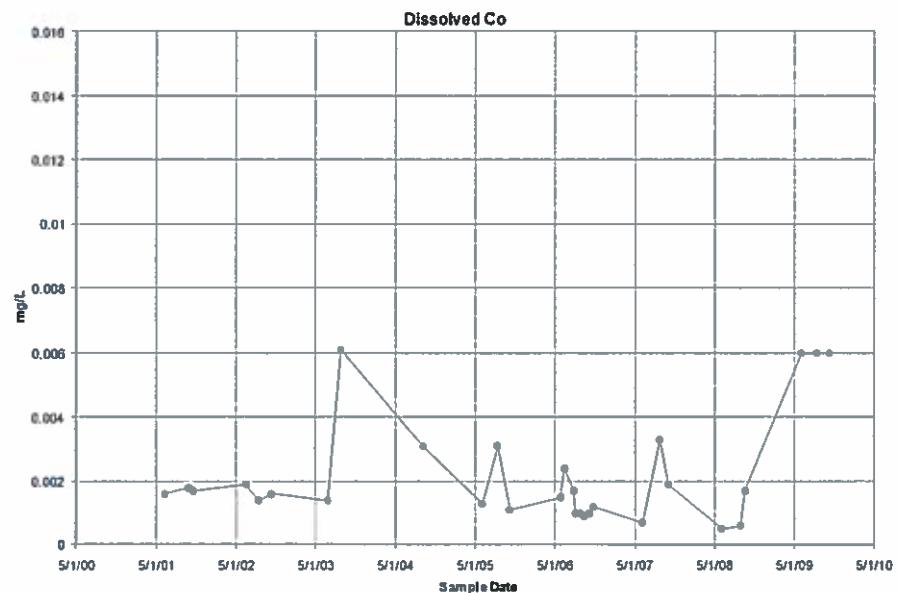


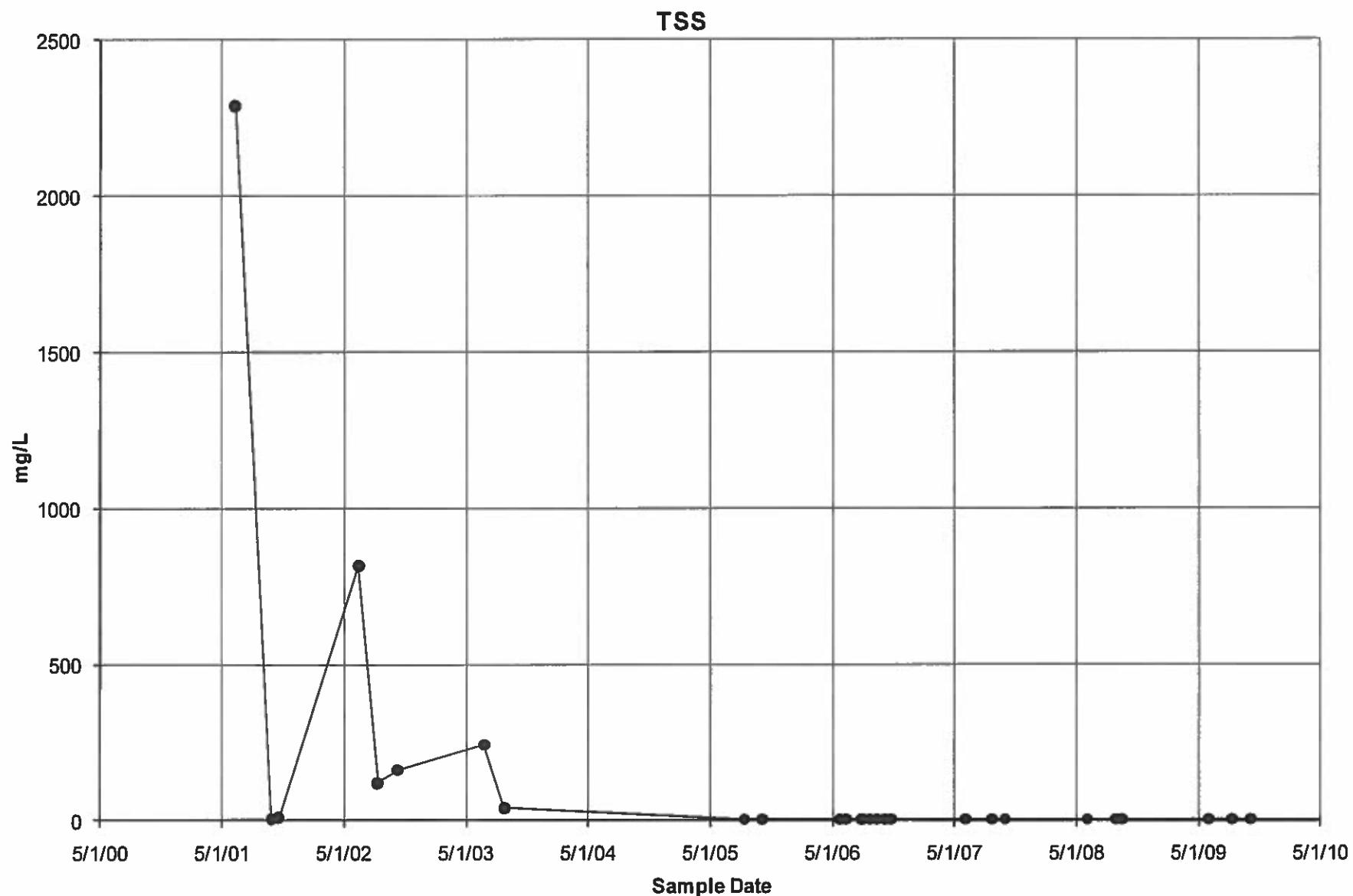


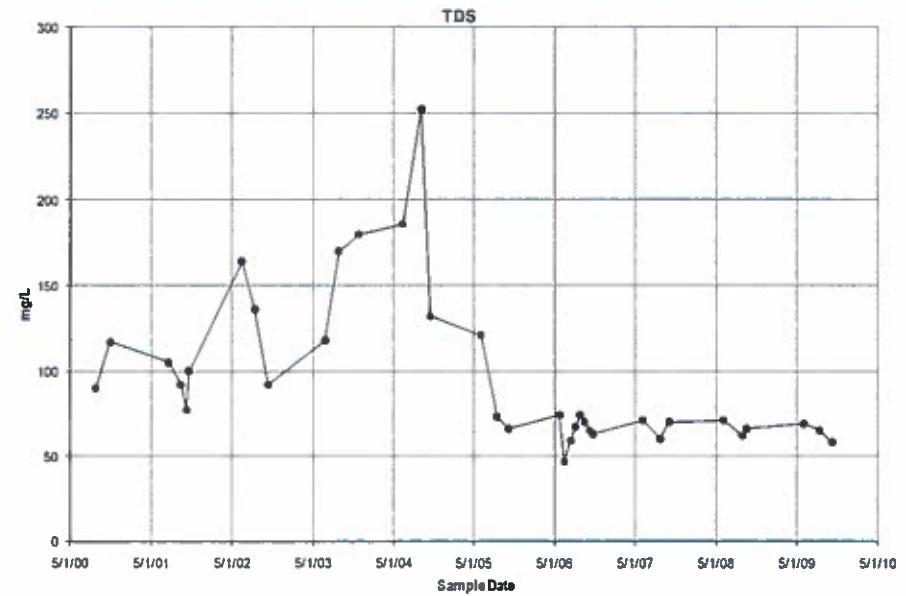
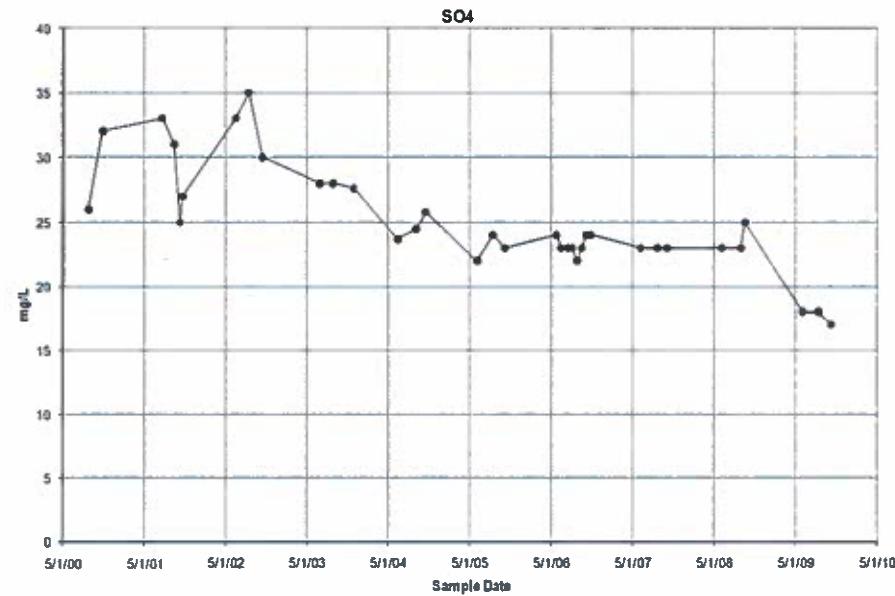
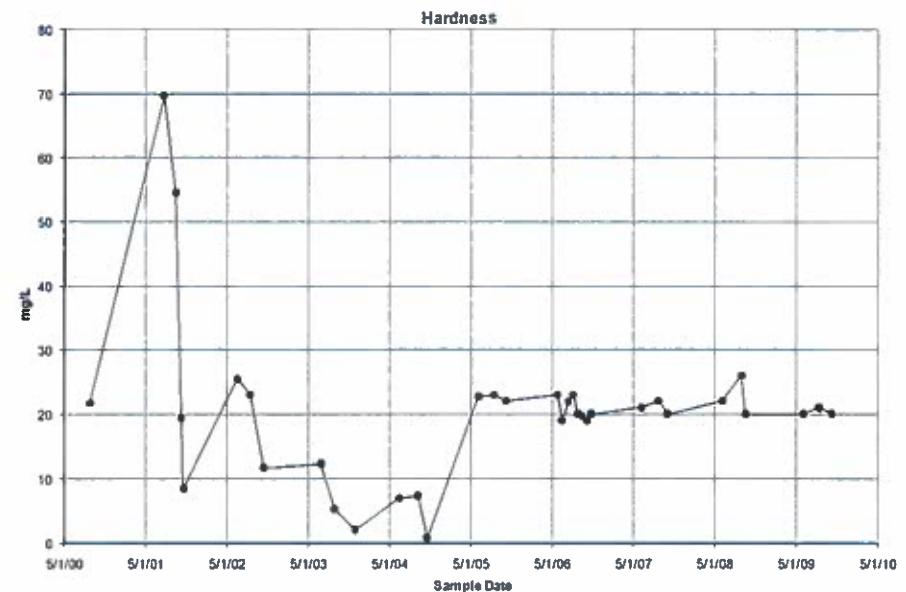
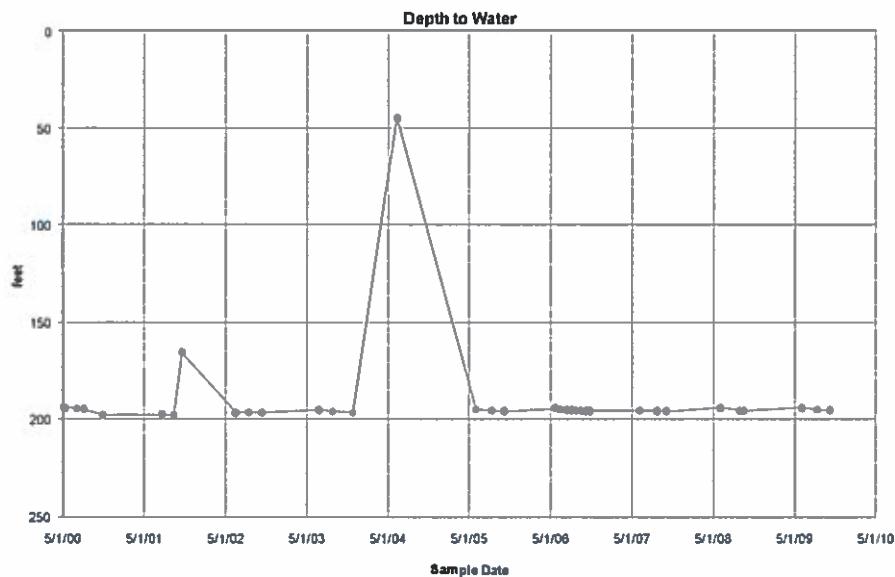
**FIGURE 2-3b**  
**2000 - 2009 DATA FOR WELL BFMW-4d**

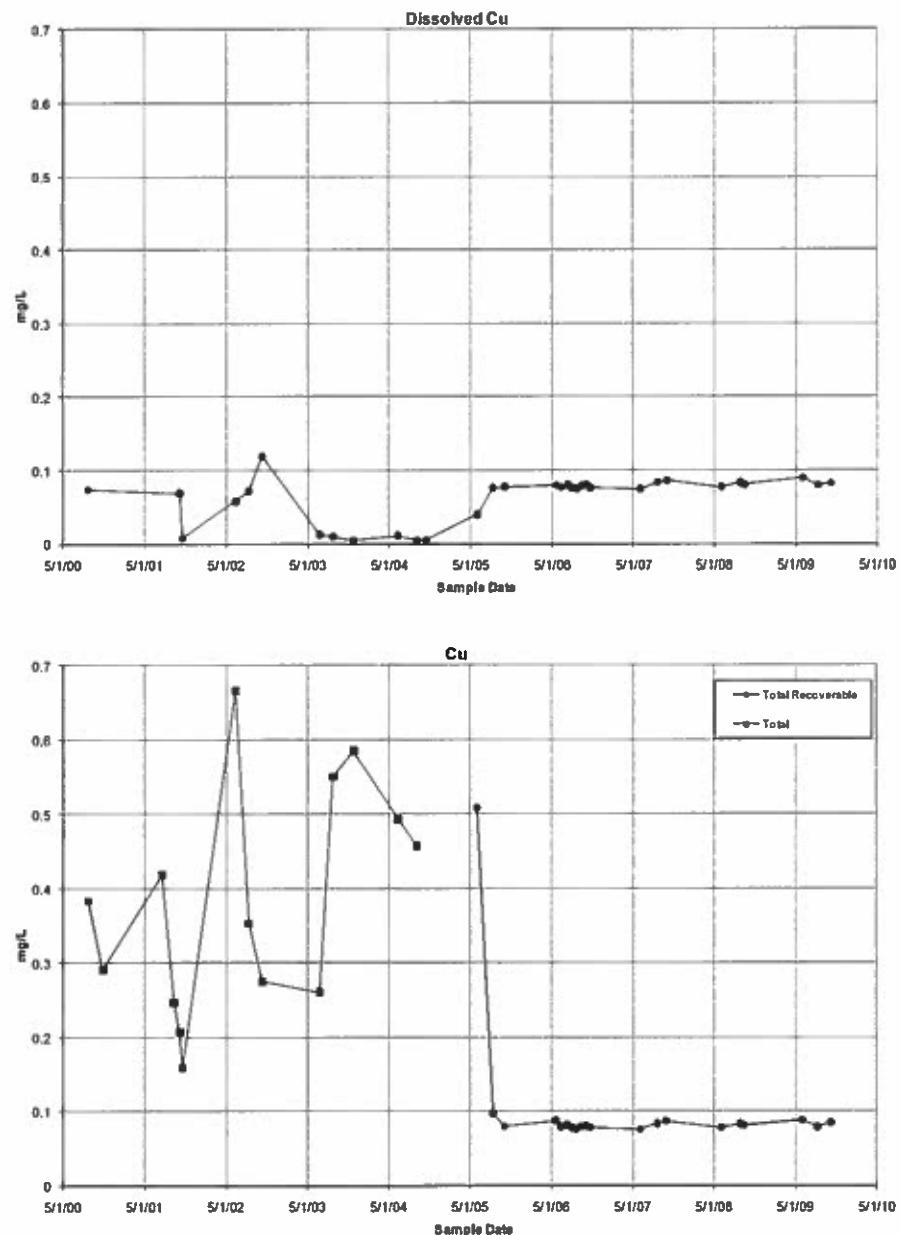
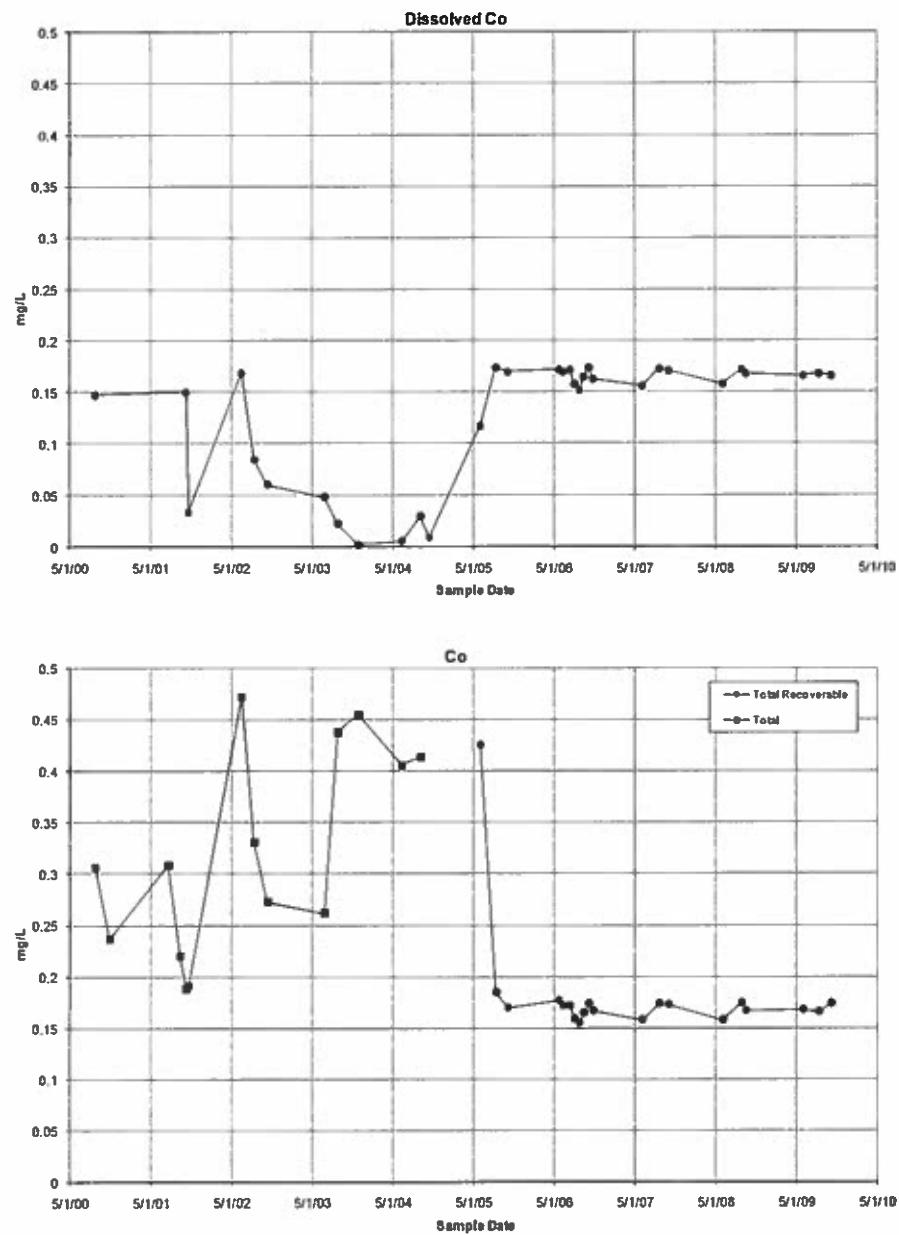
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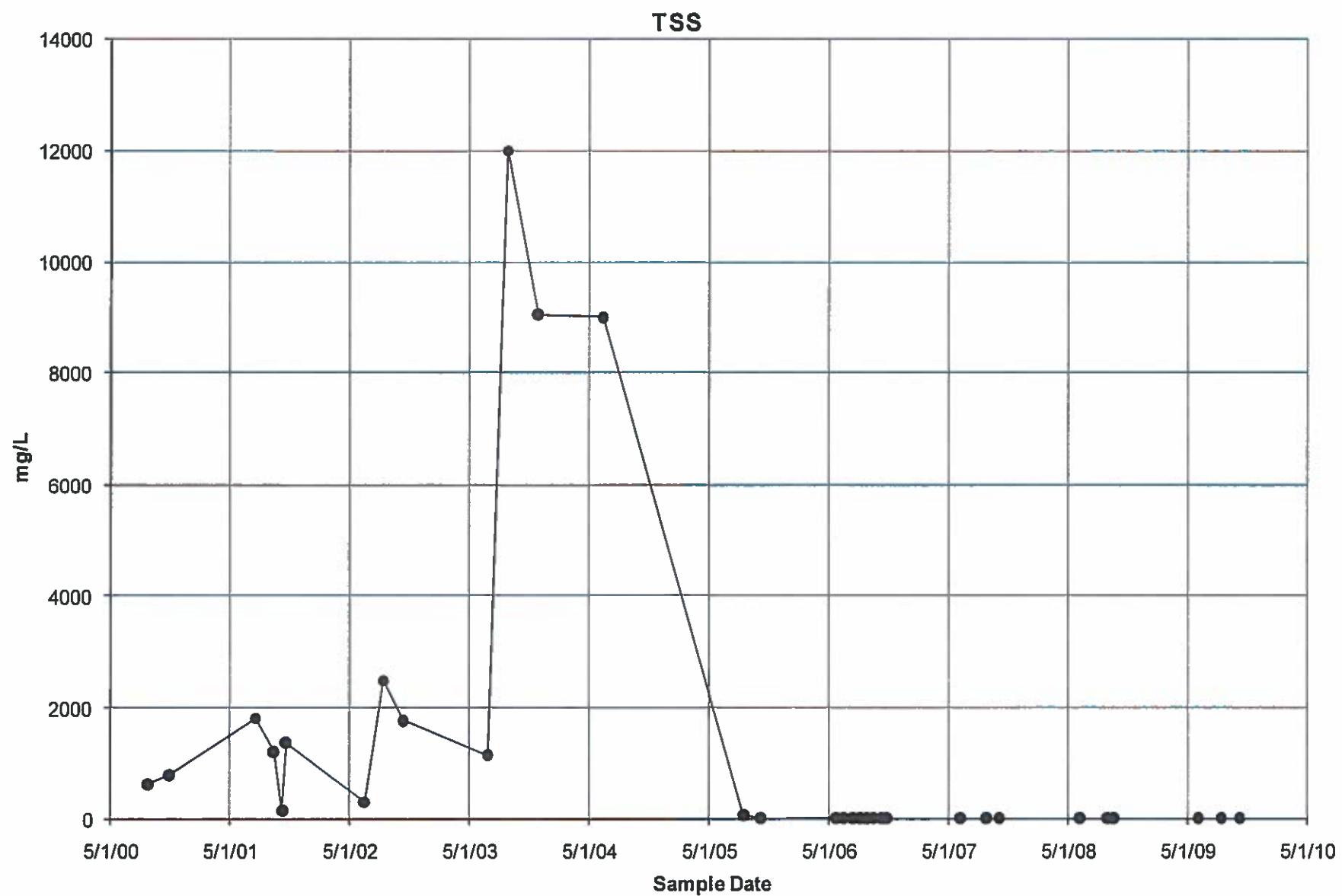


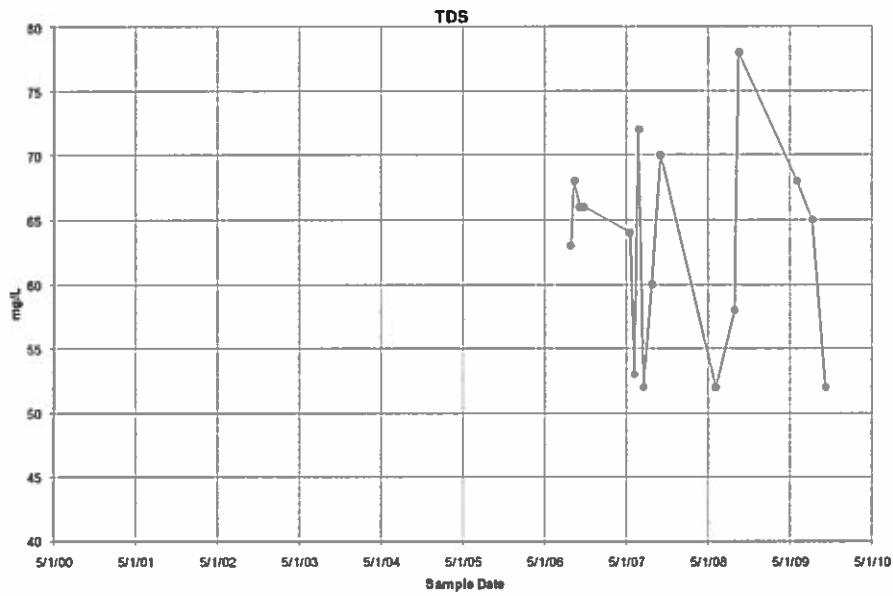
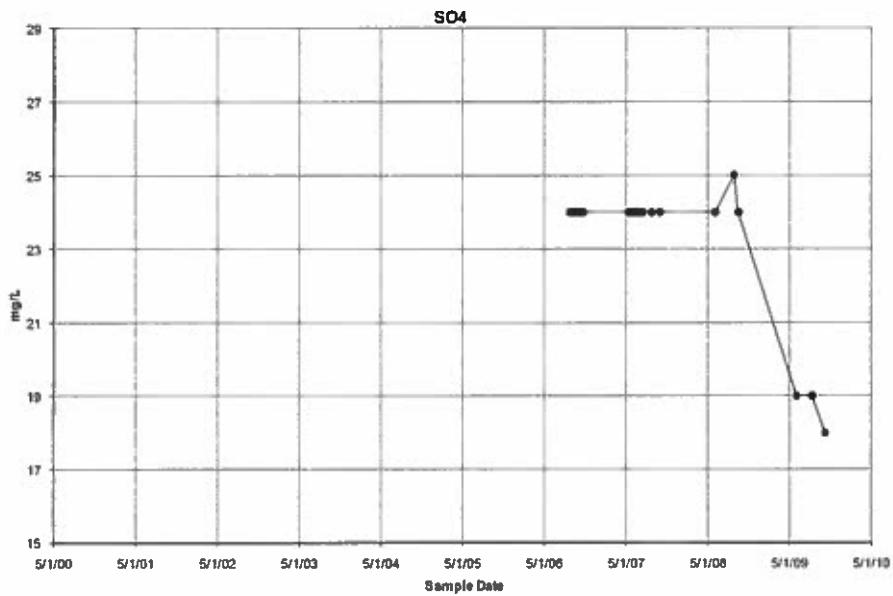
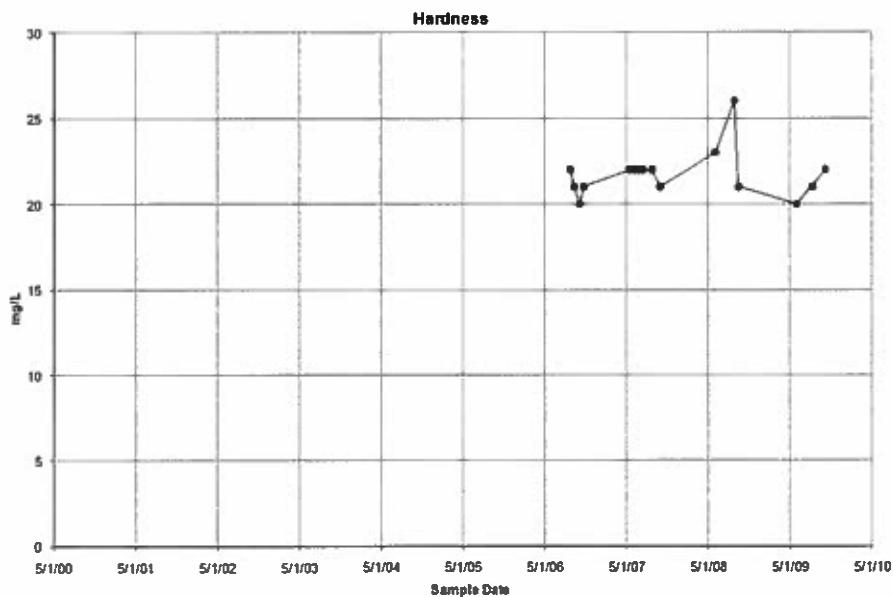
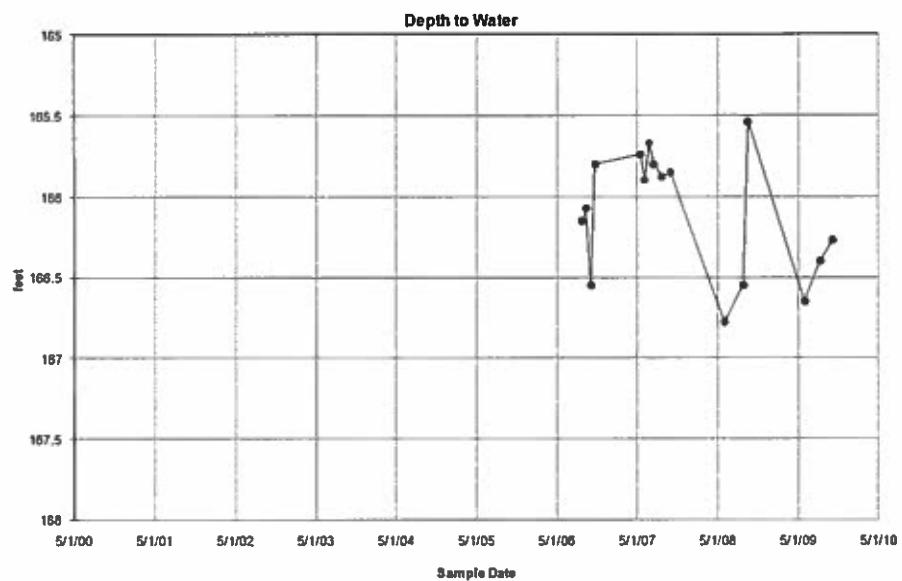


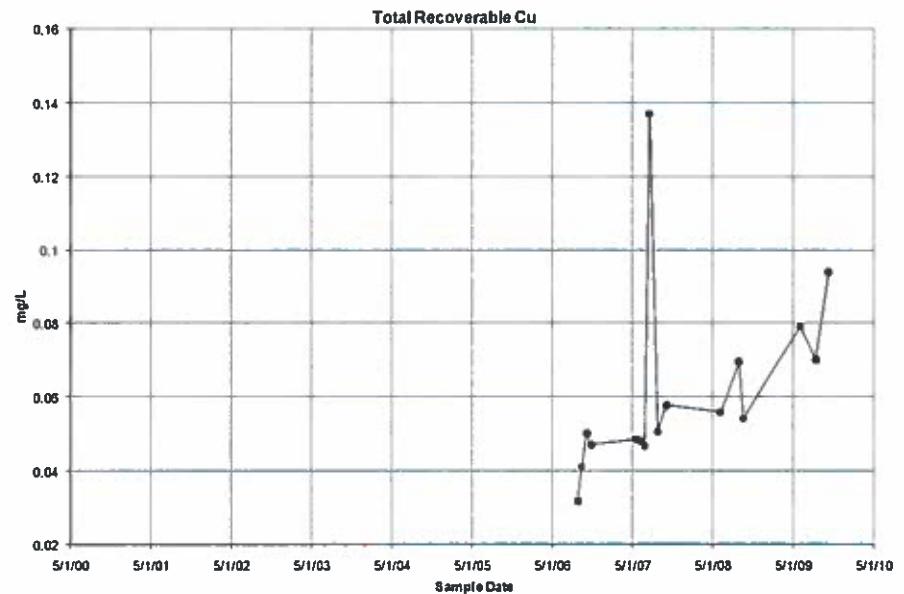
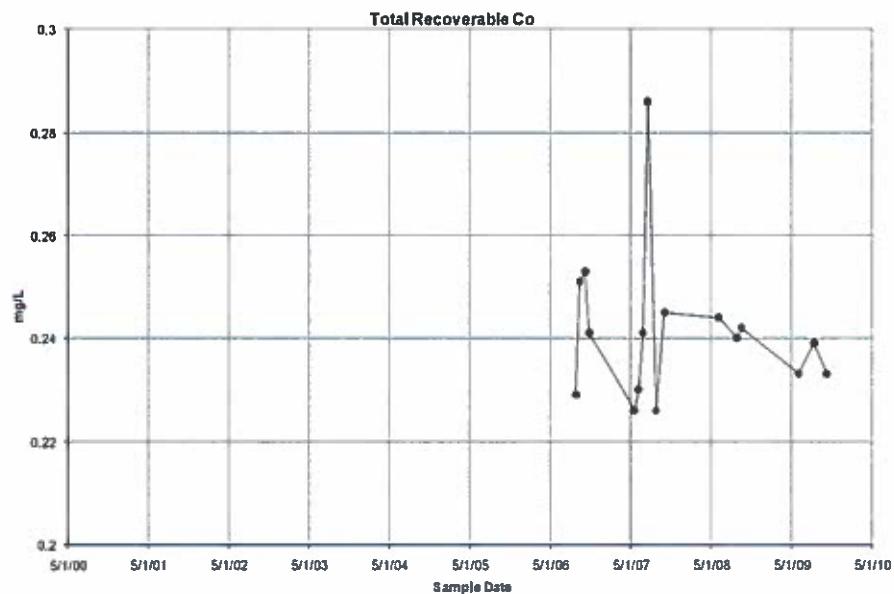
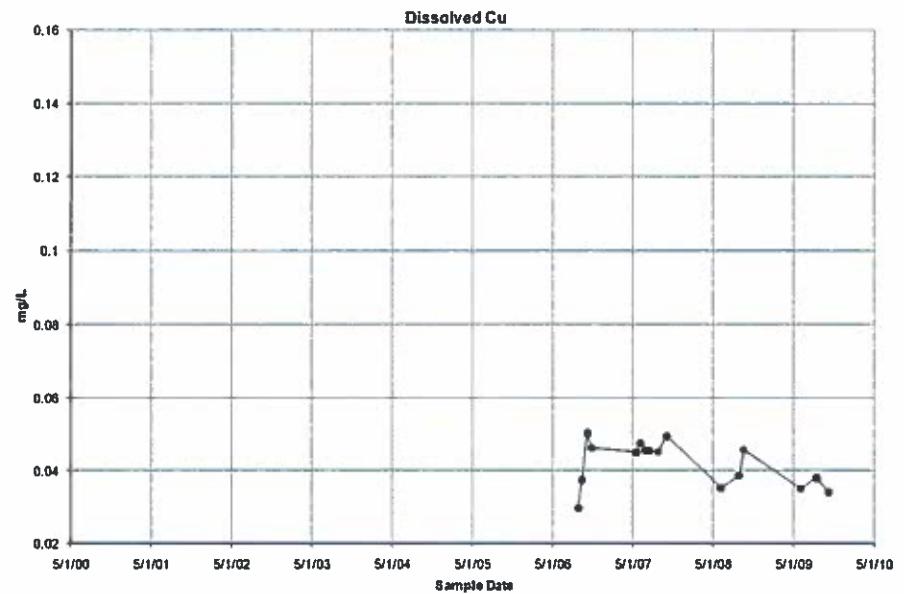
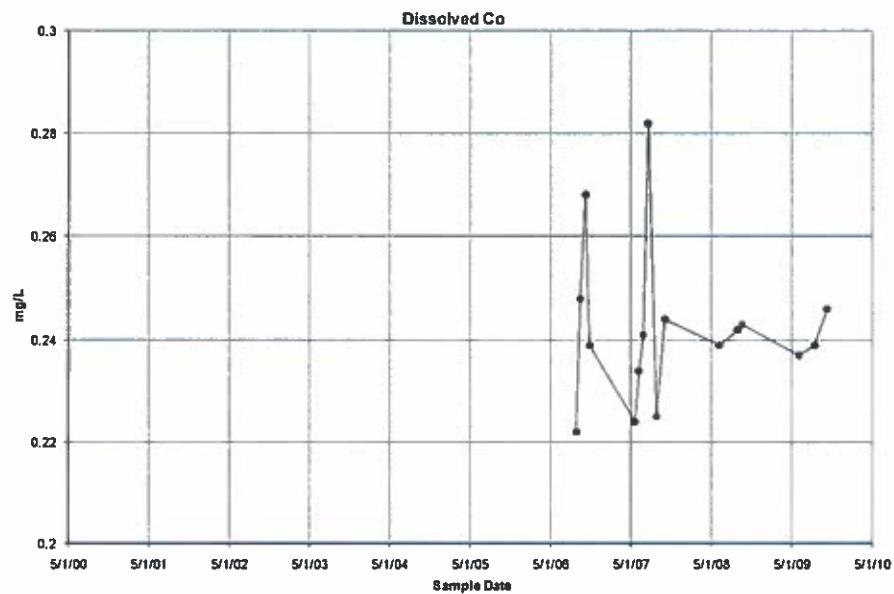








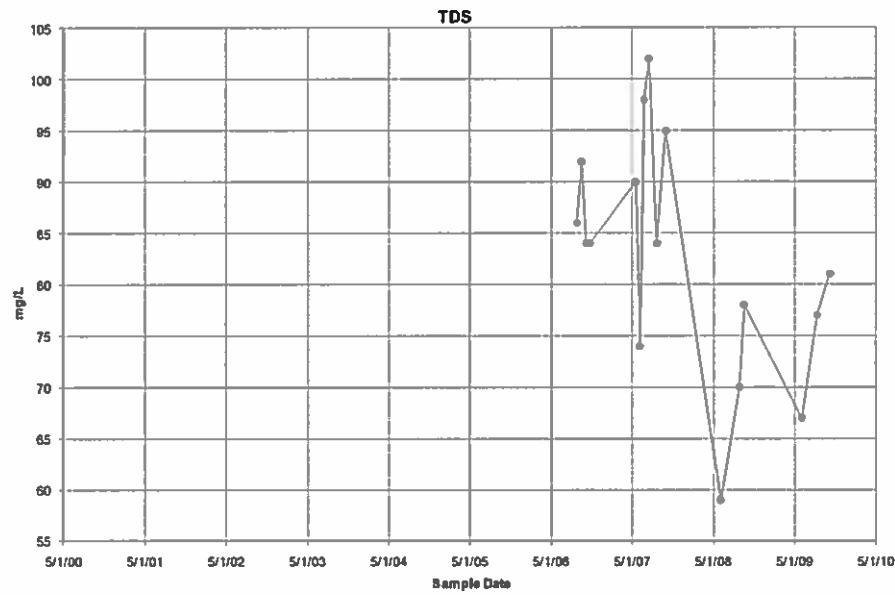
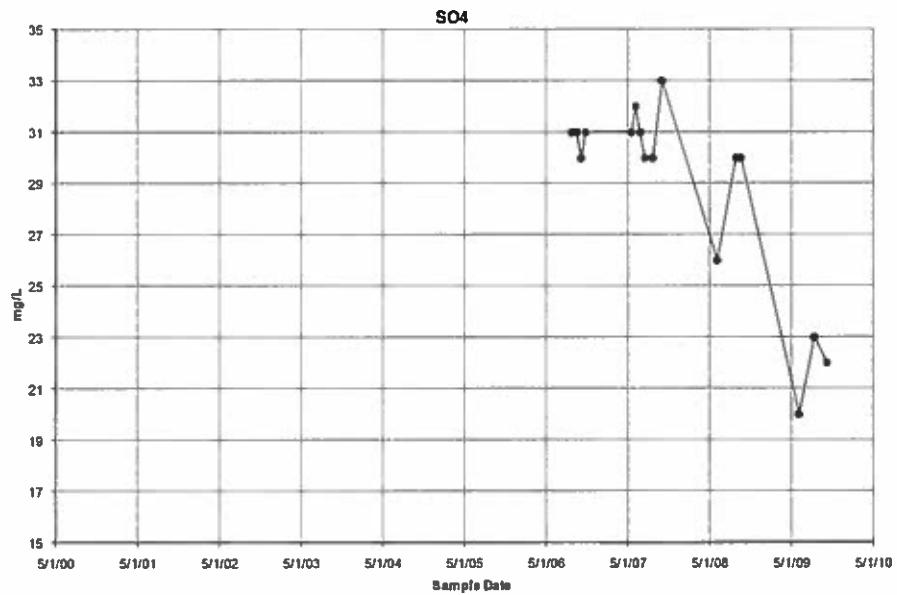
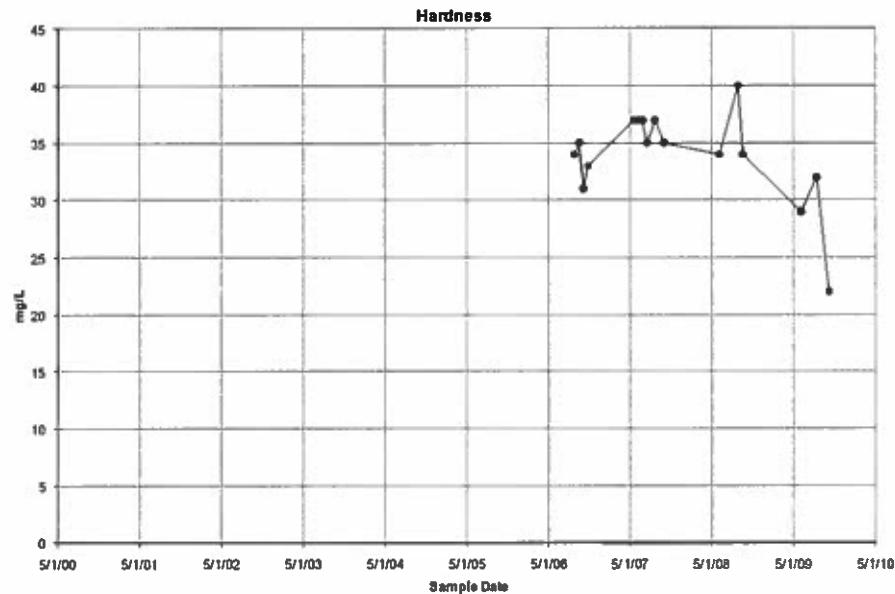
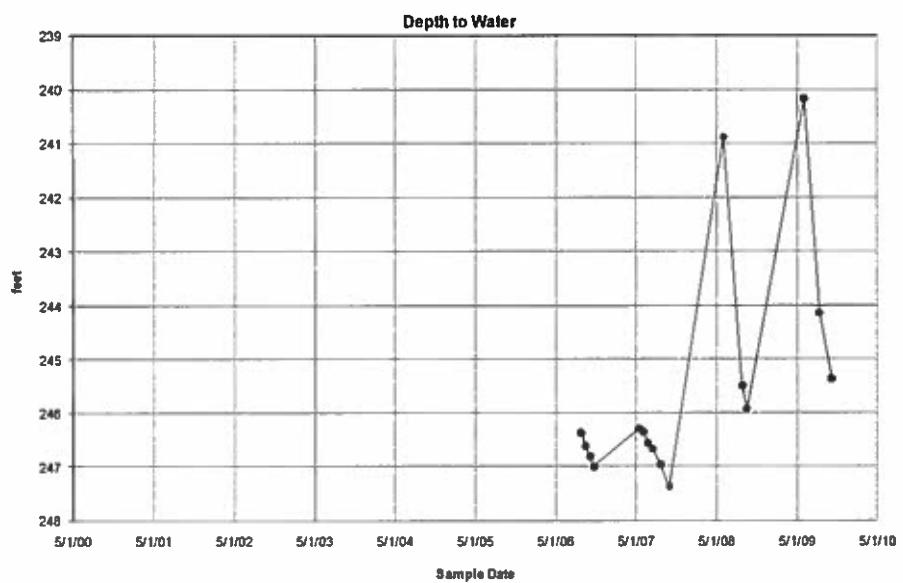


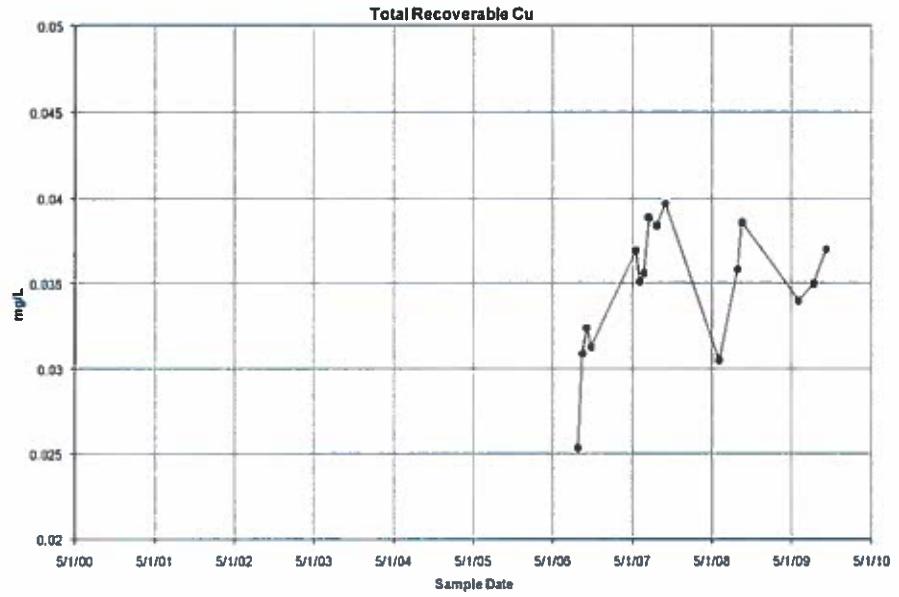
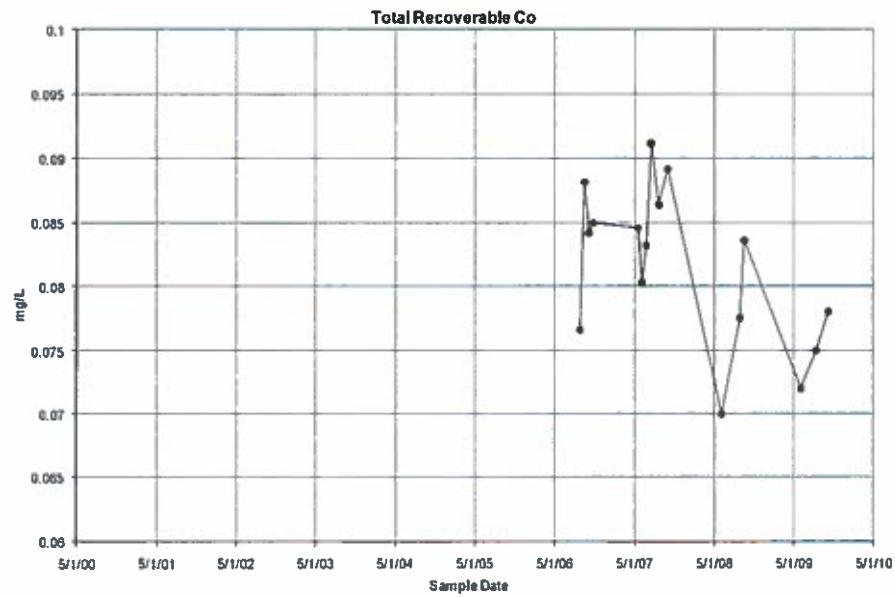
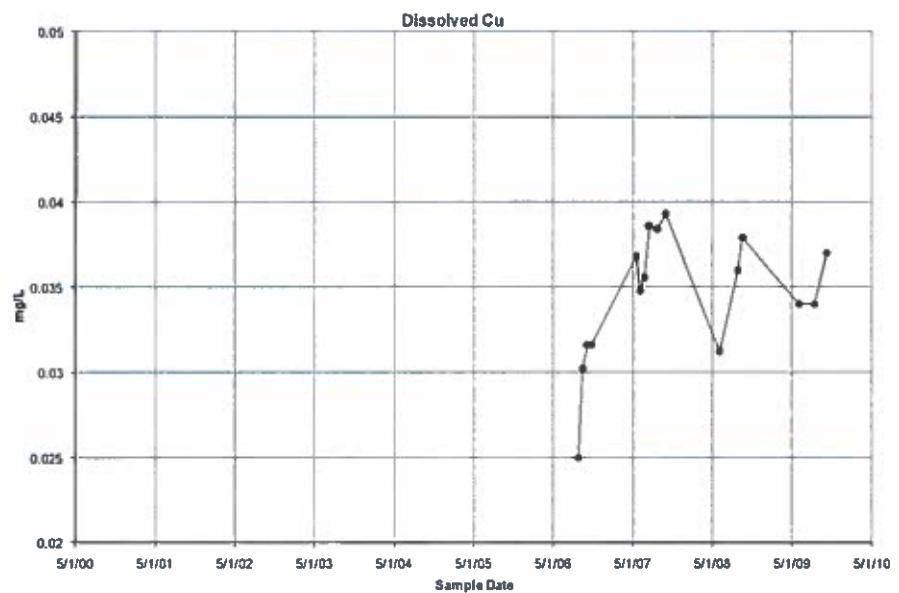
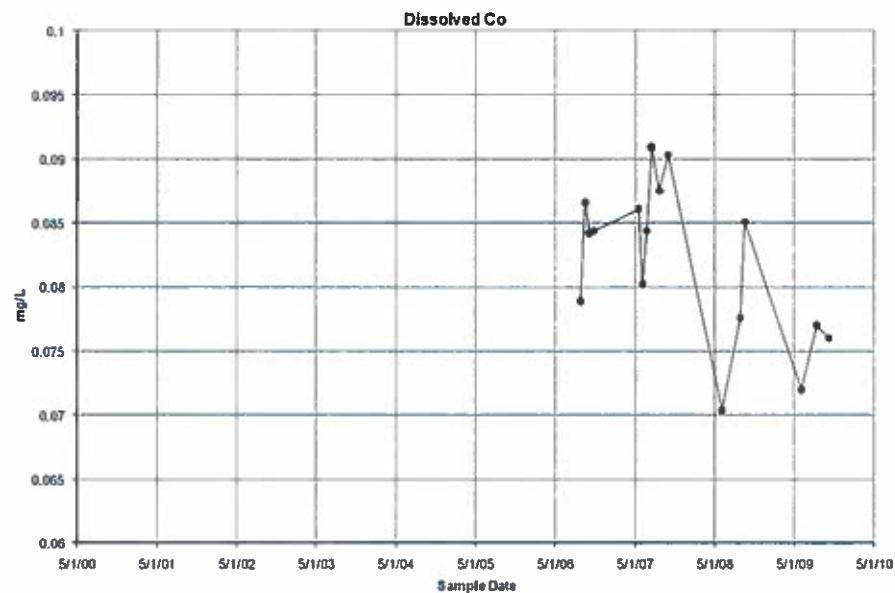


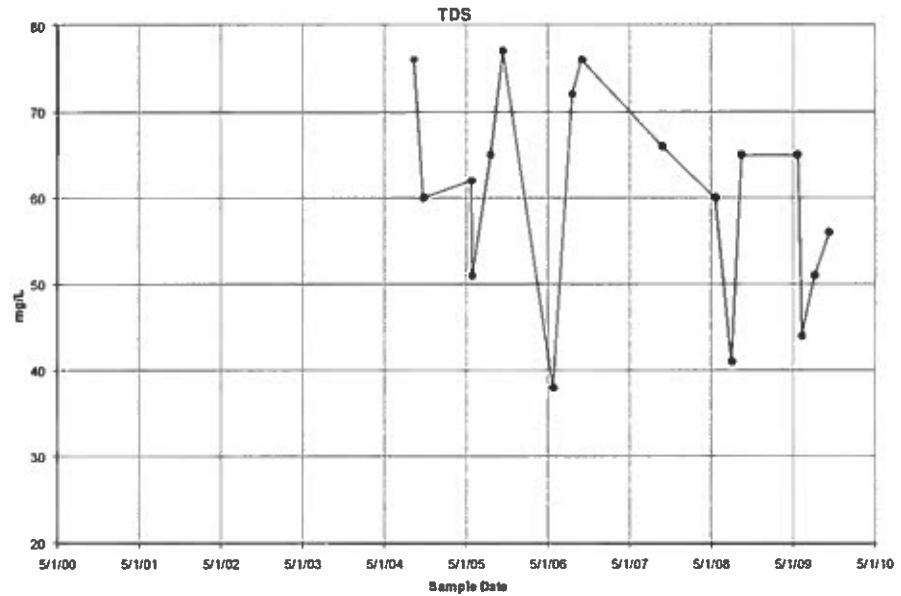
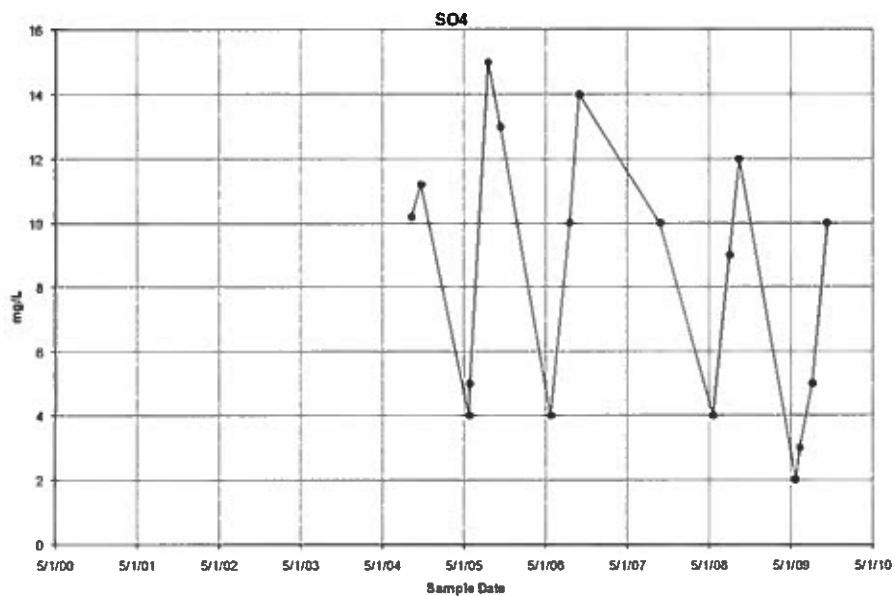
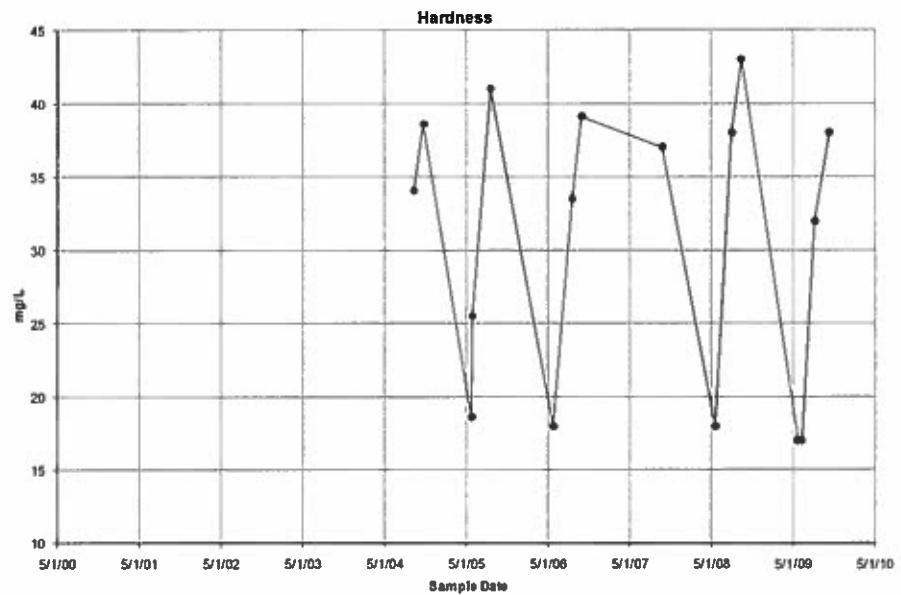
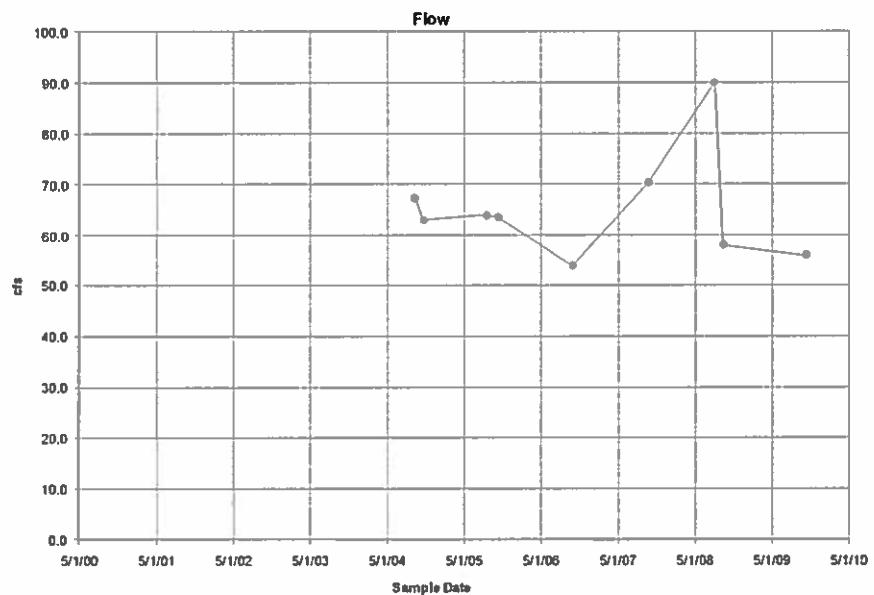
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**FIGURE 2-6b  
2000 - 2009 DATA FOR WELL RMW-6**

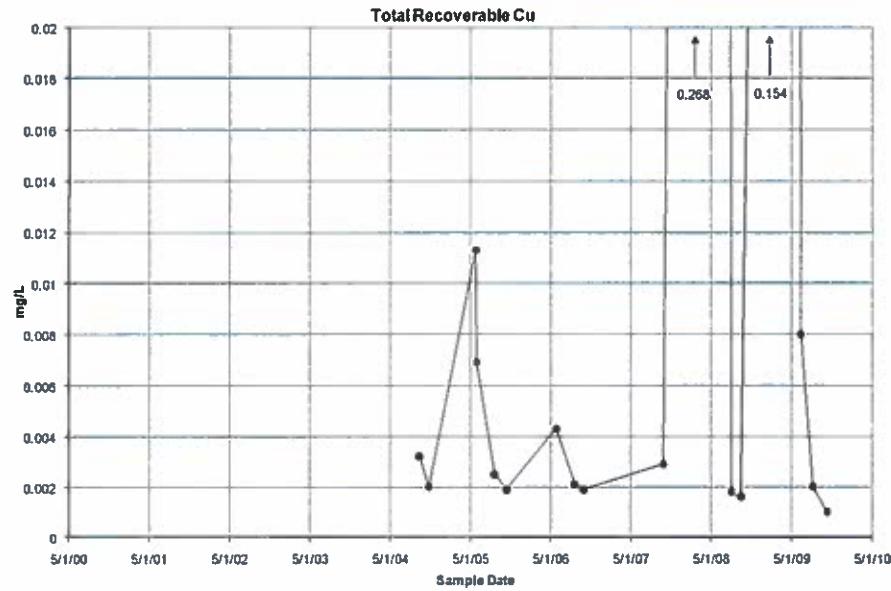
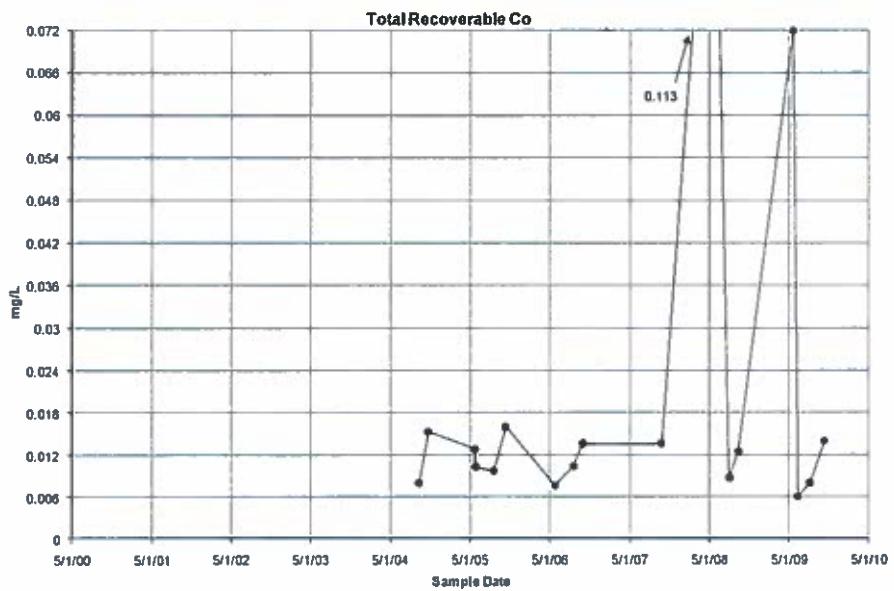
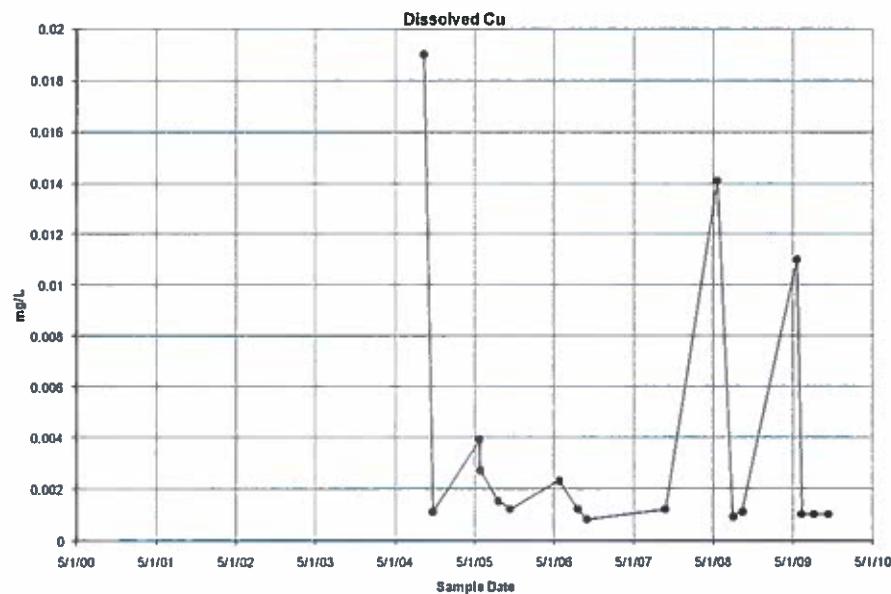
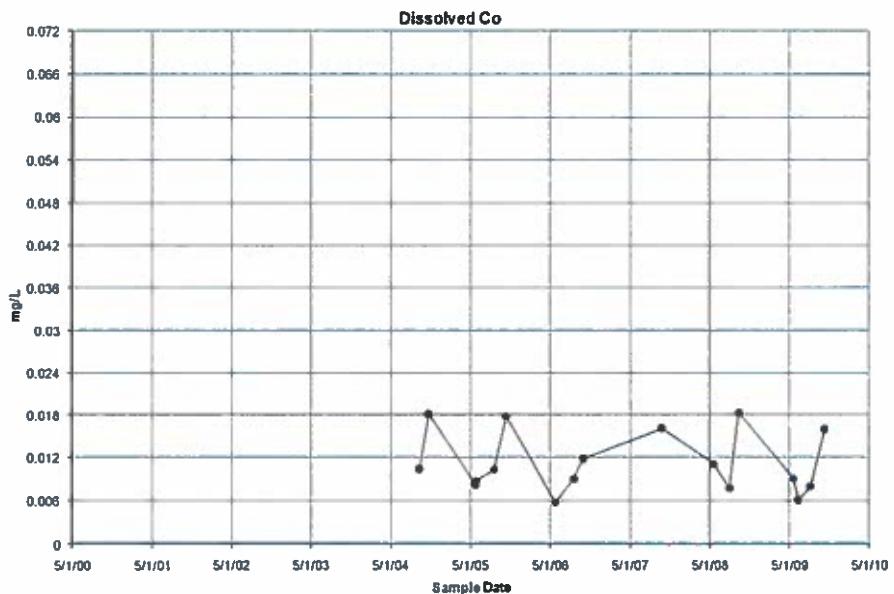
**FIGURE 2-6b**  
**2000 - 2009 DATA FOR WELL RMW-6**

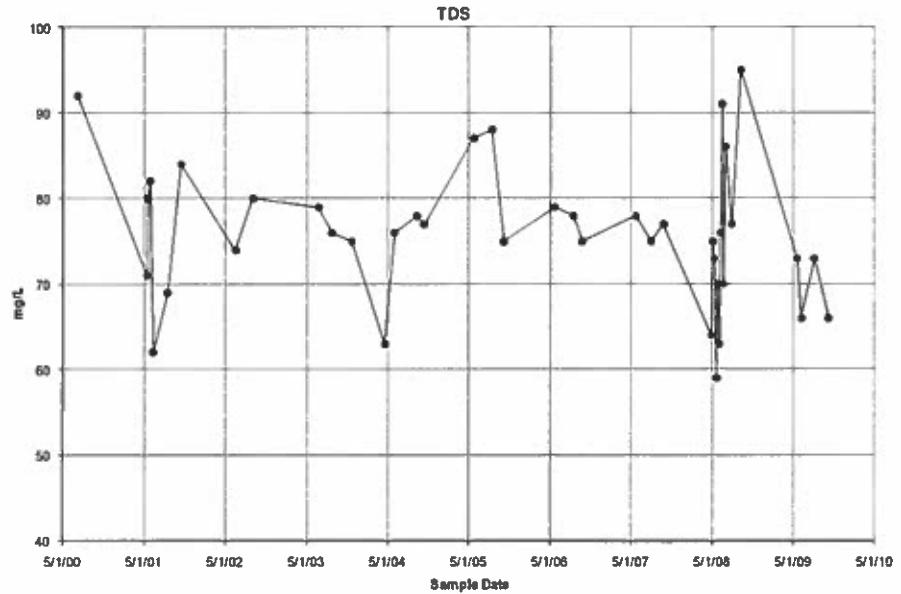
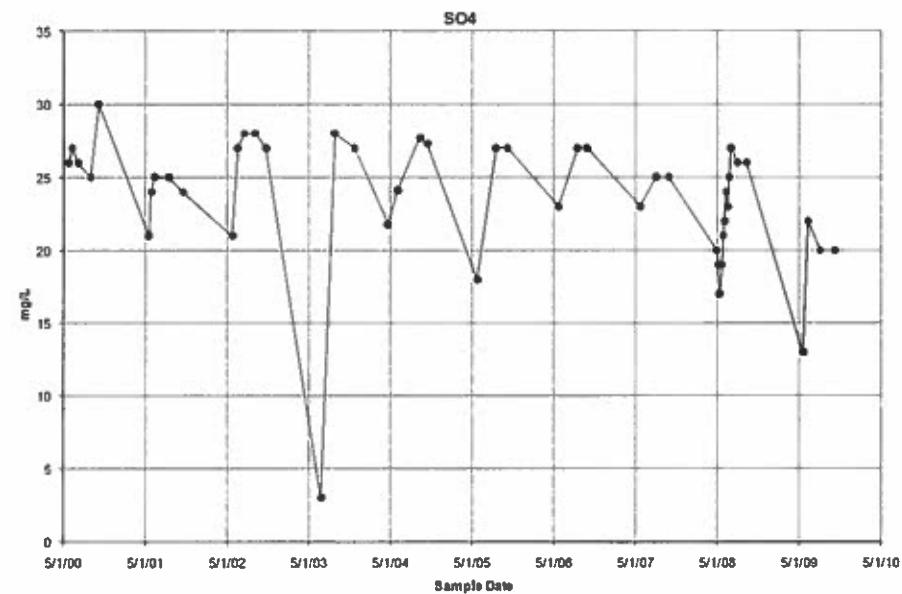
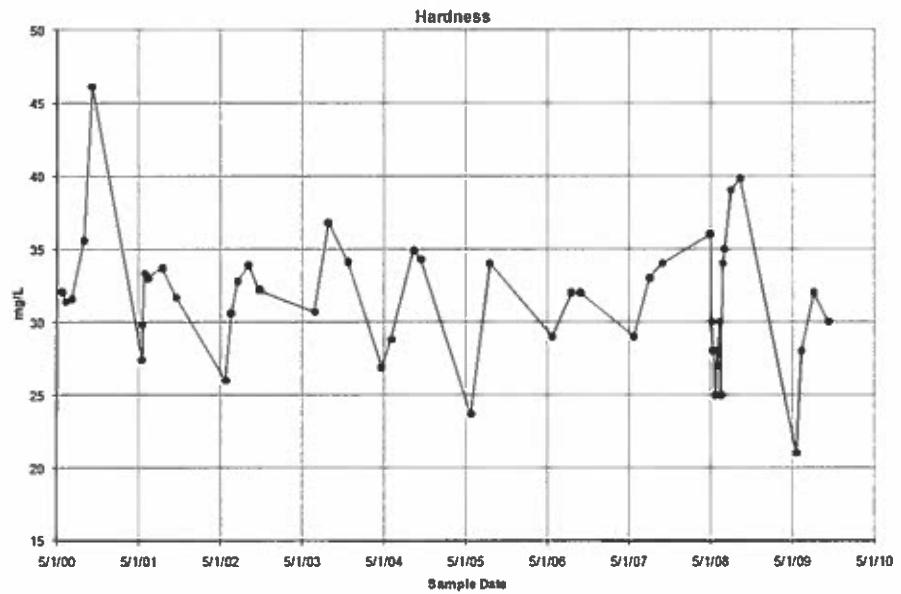
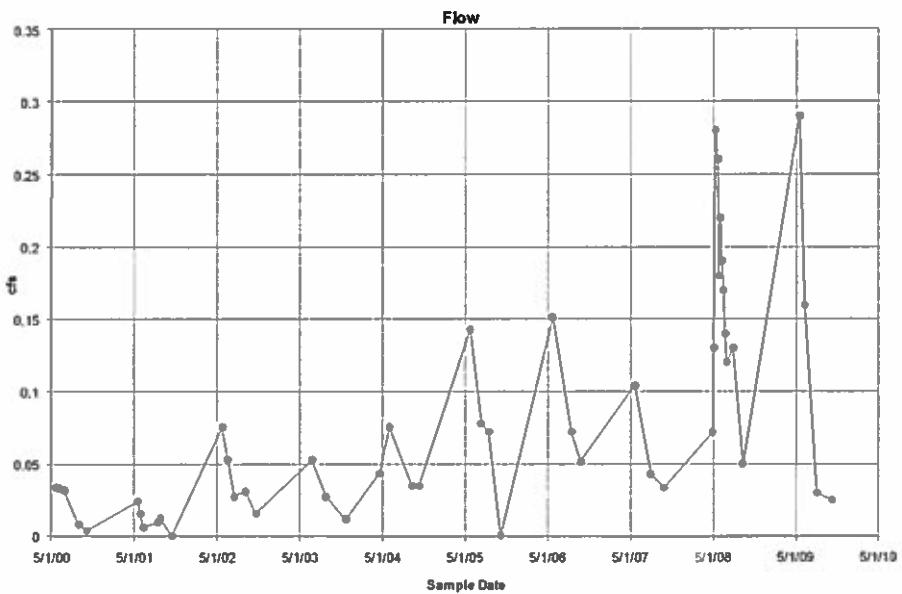


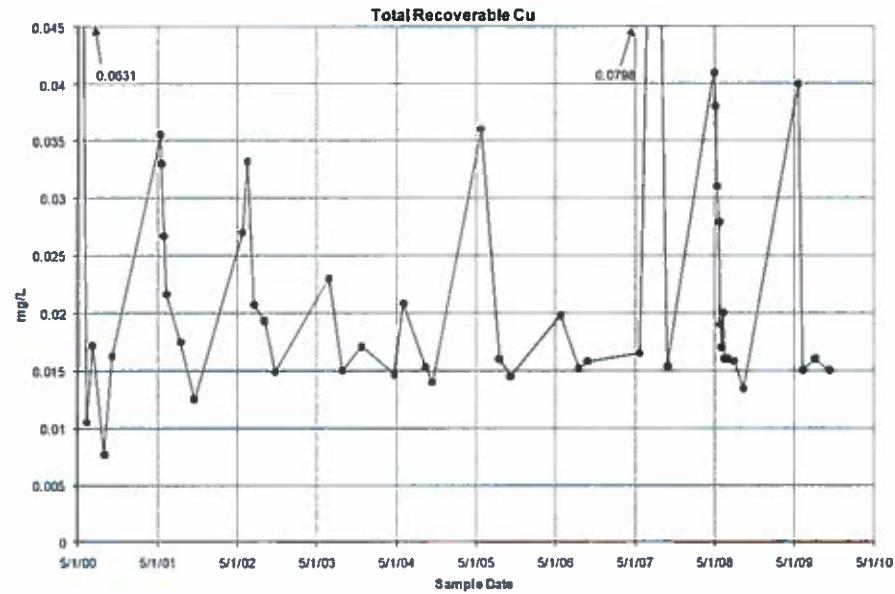
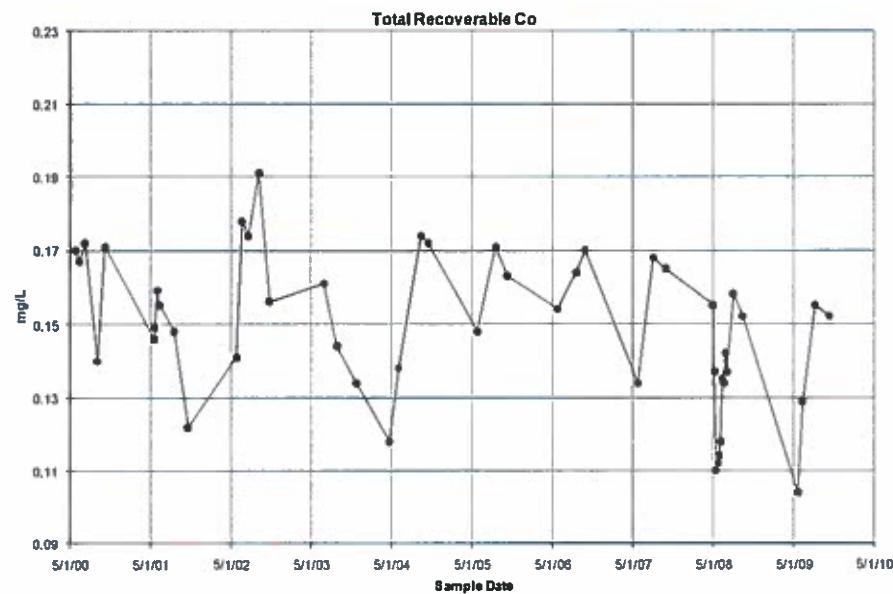
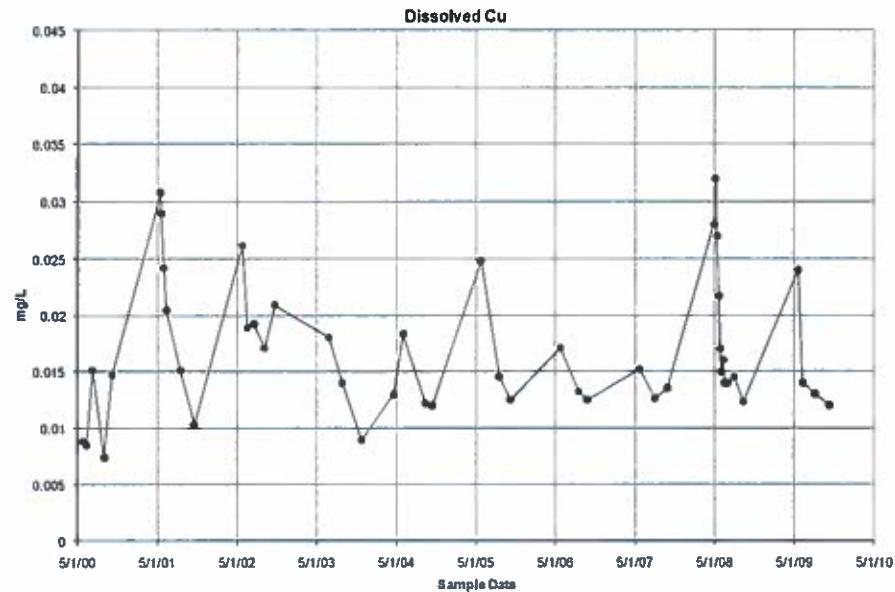
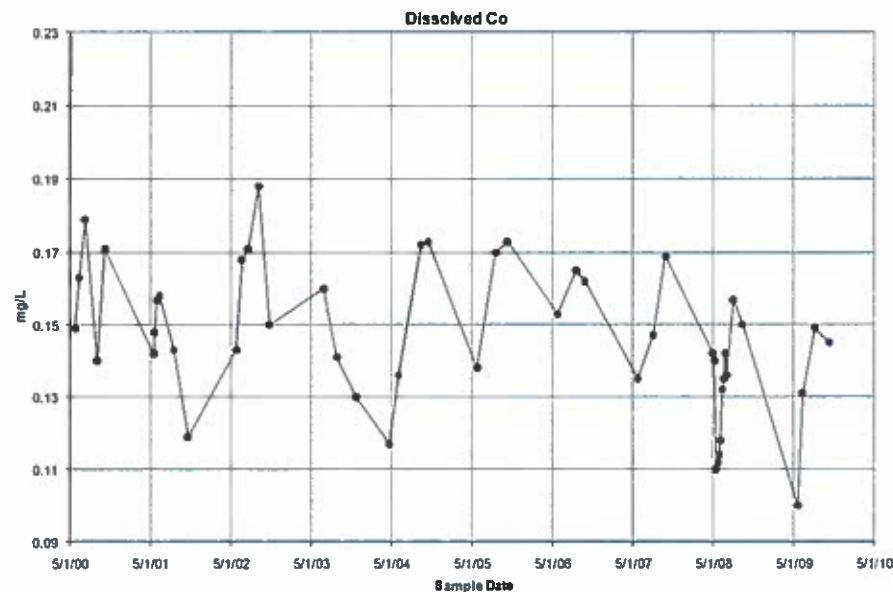




**FIGURE 3-1a**  
**2000 - 2009 DATA FOR SAMPLING LOCATION WQ-3**



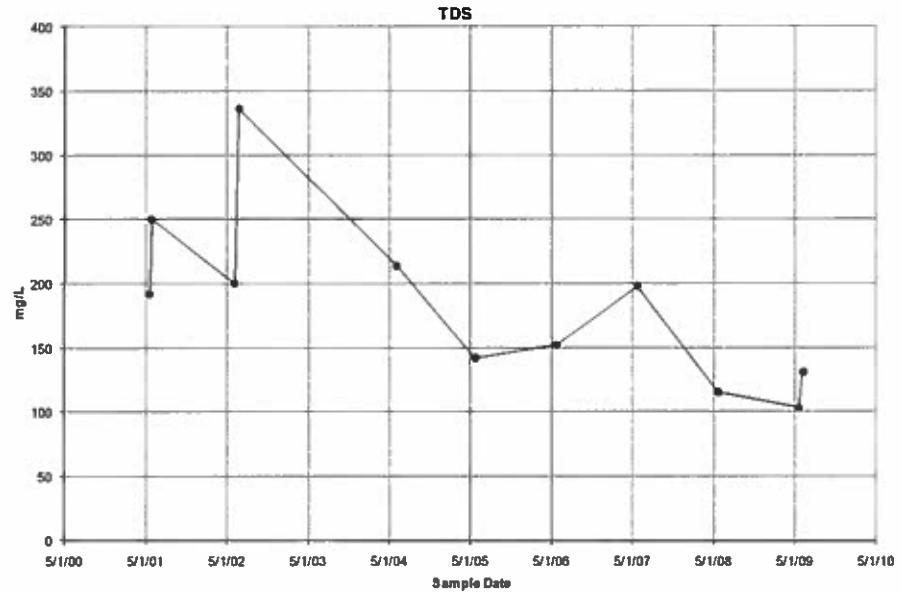
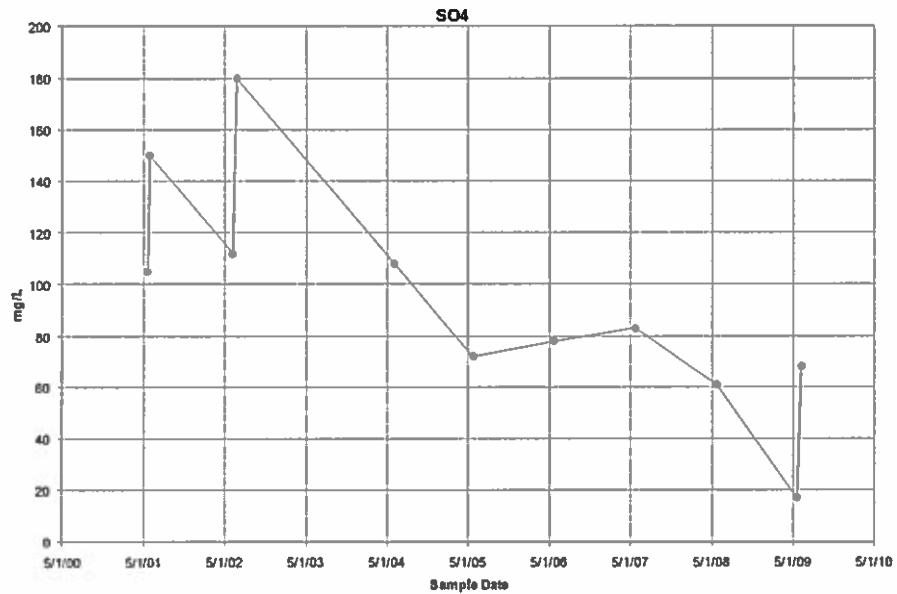
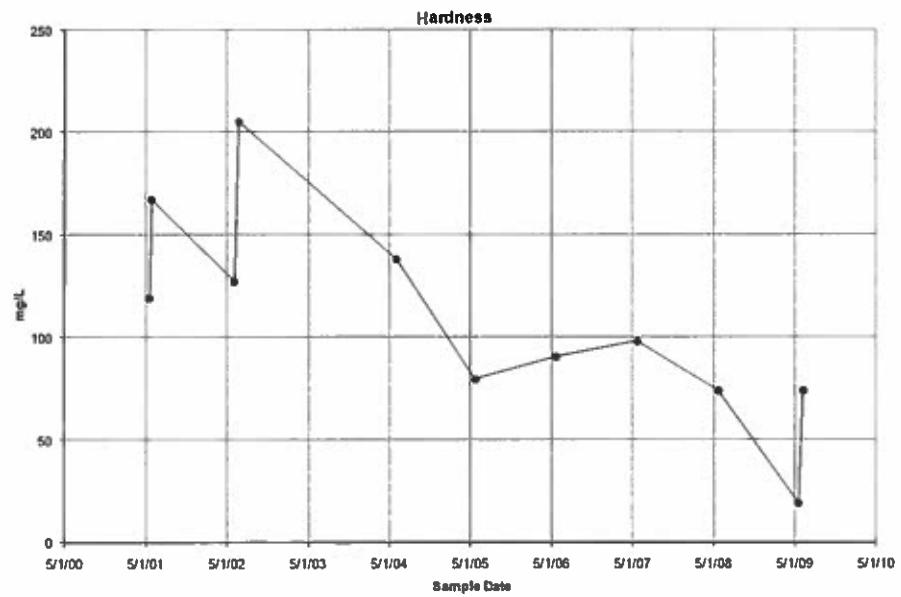
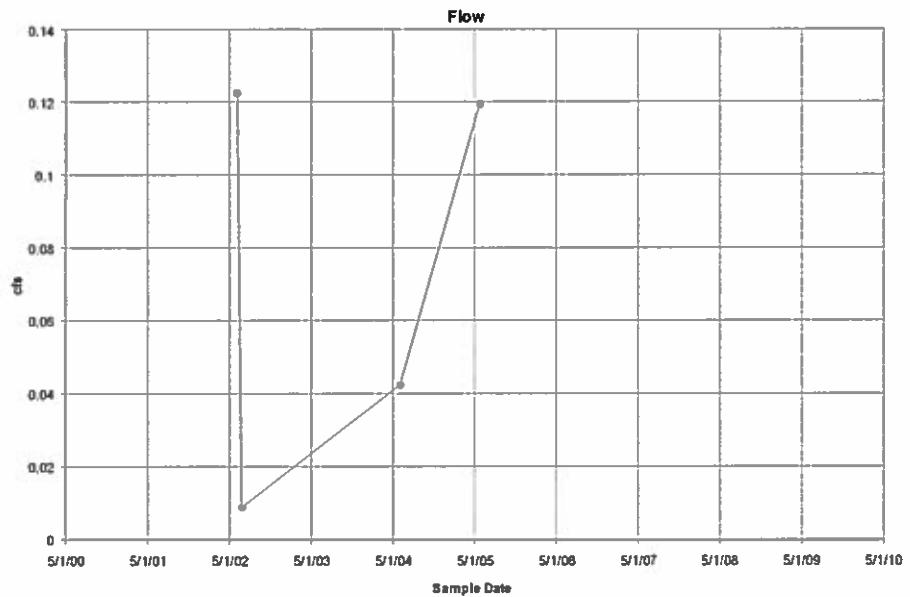


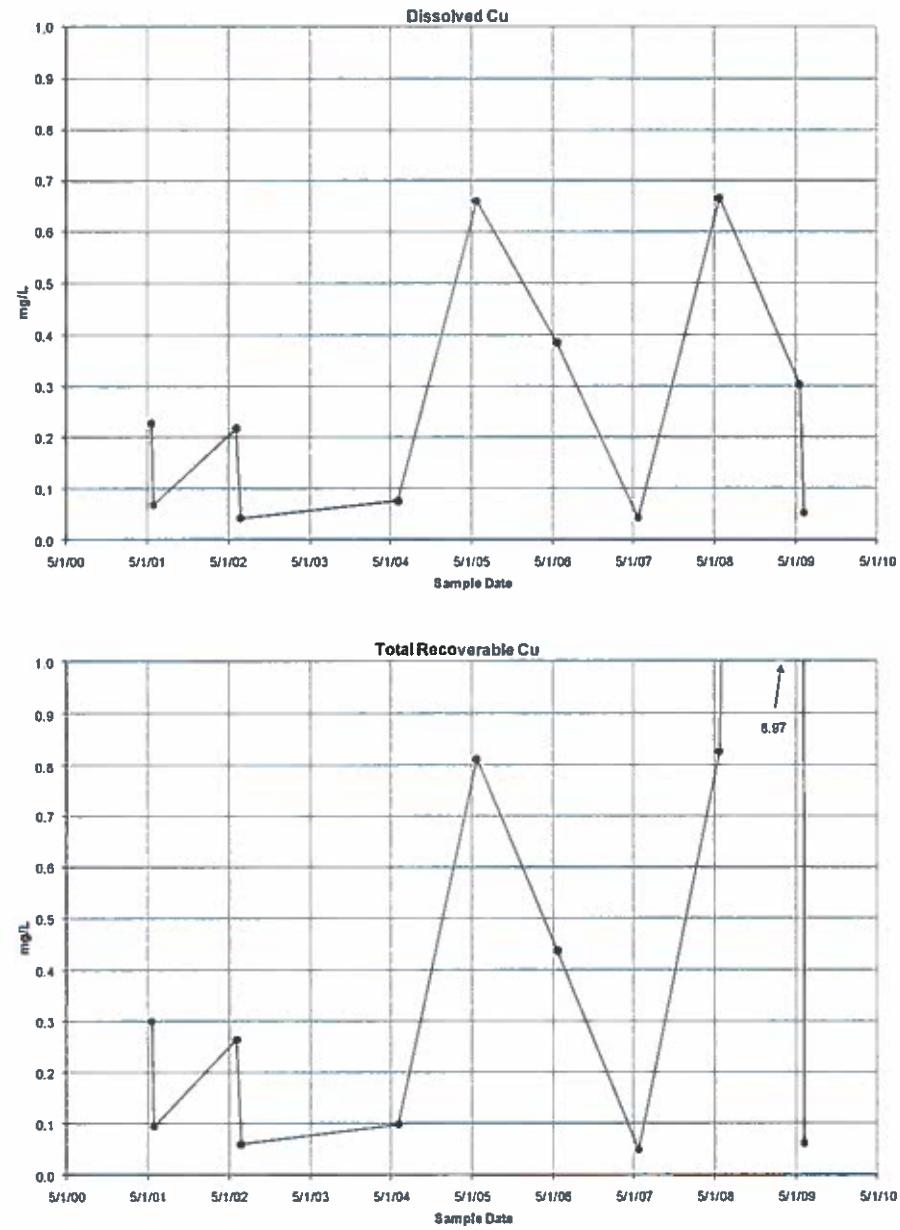
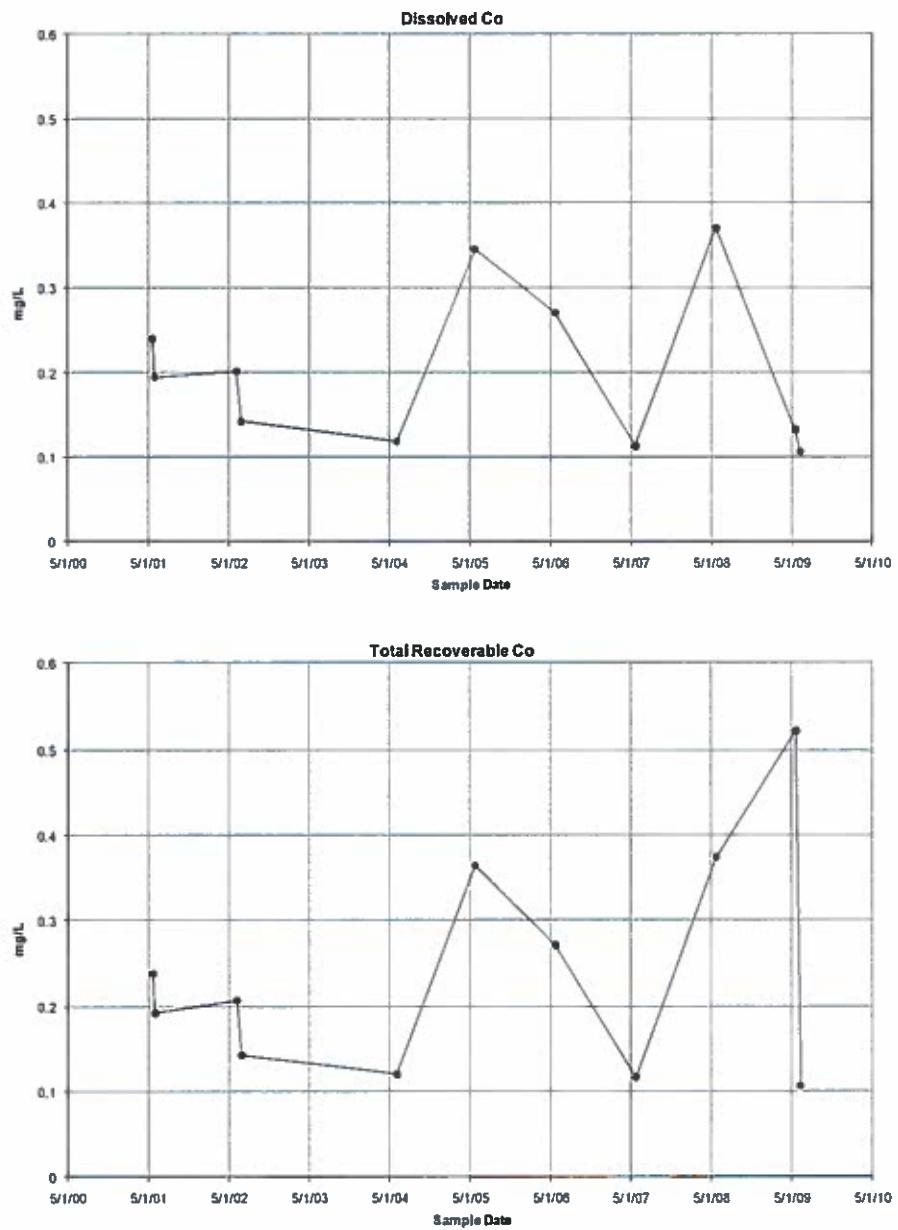


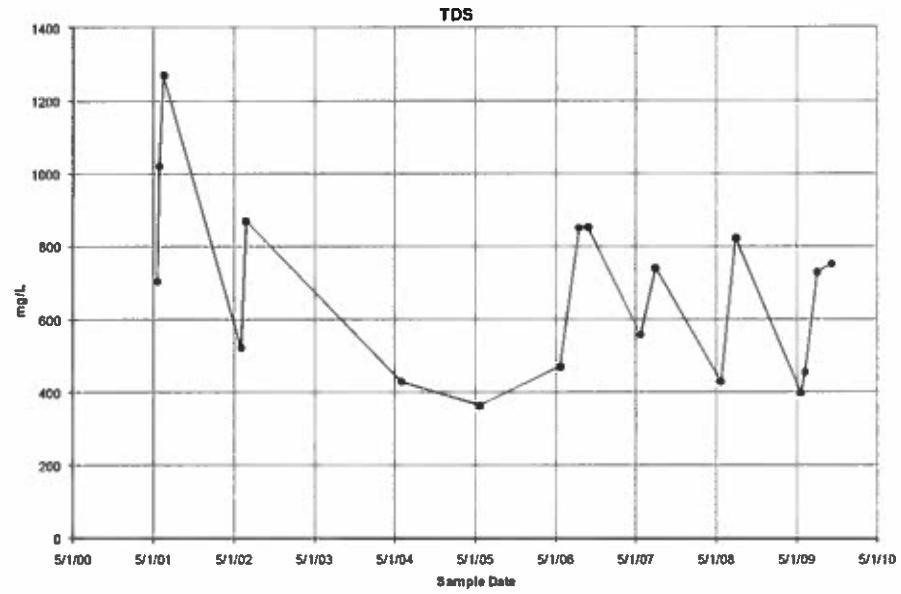
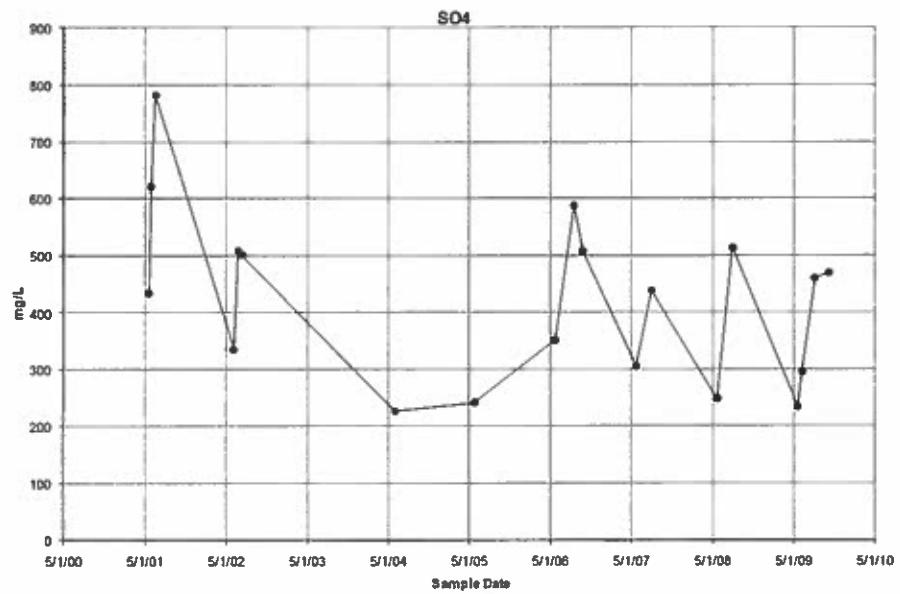
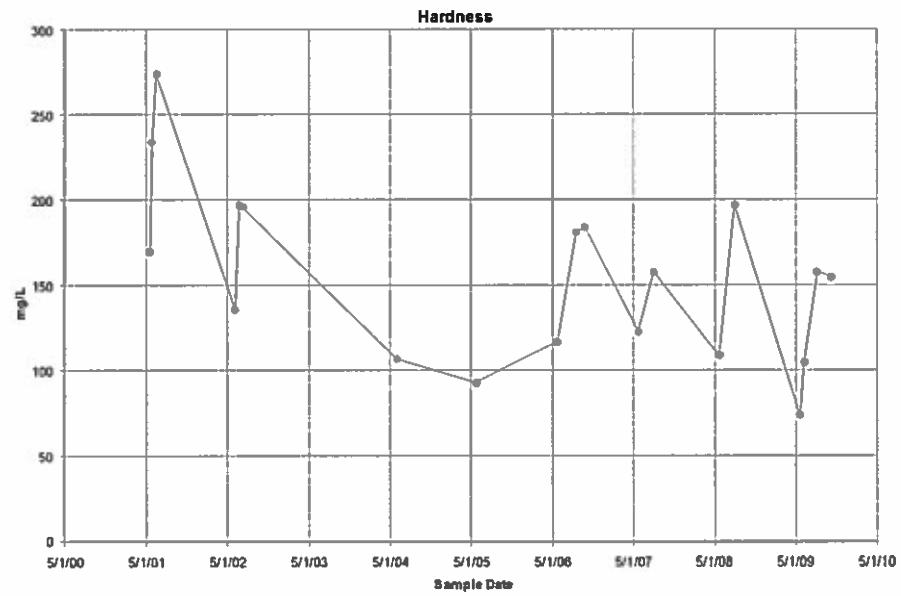
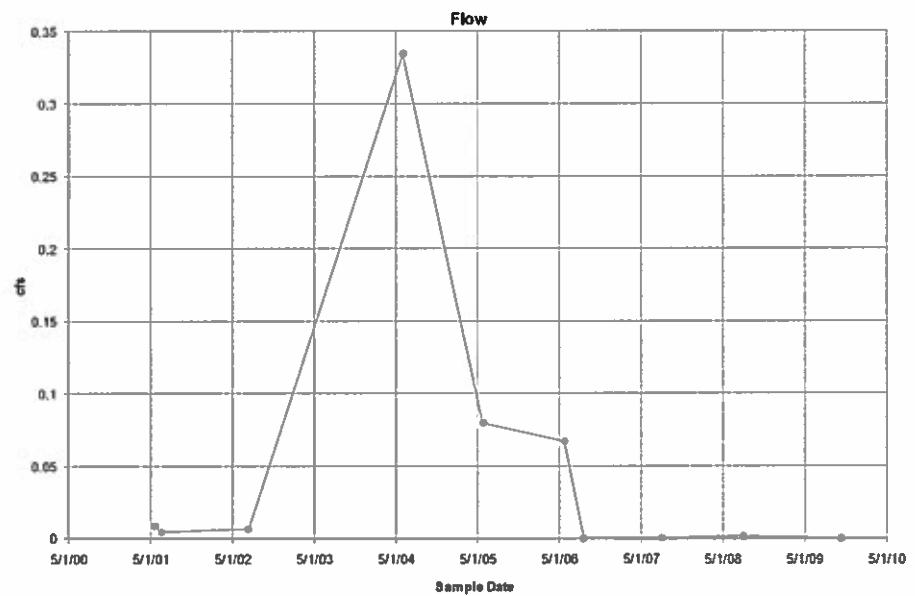
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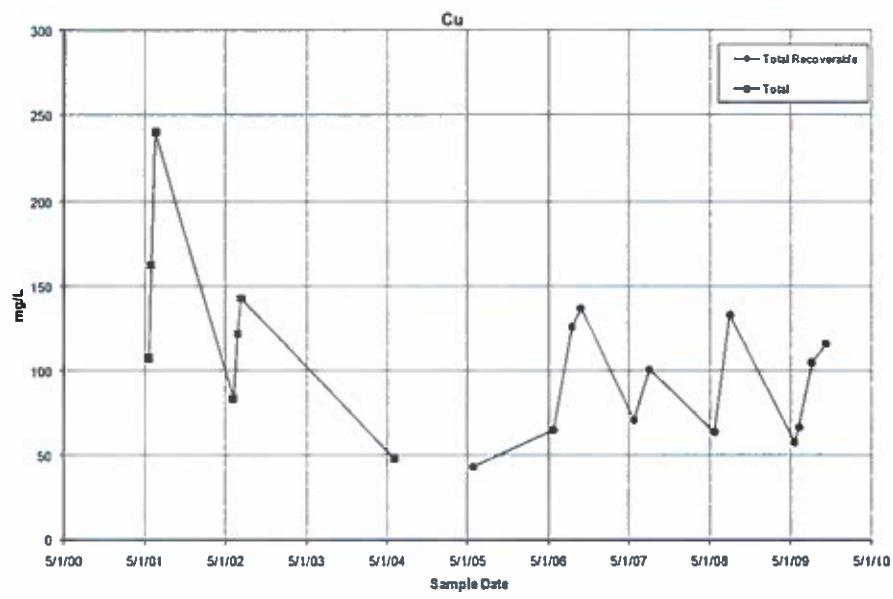
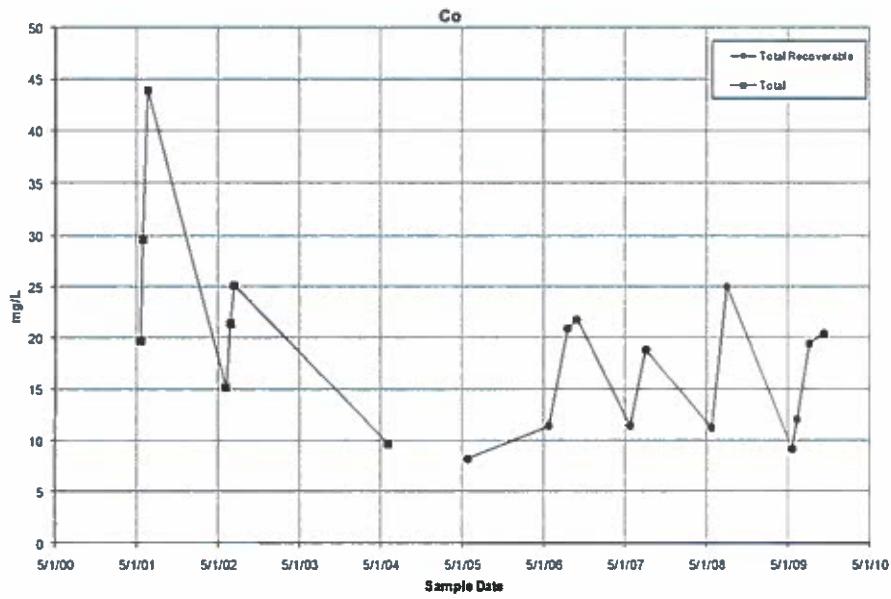
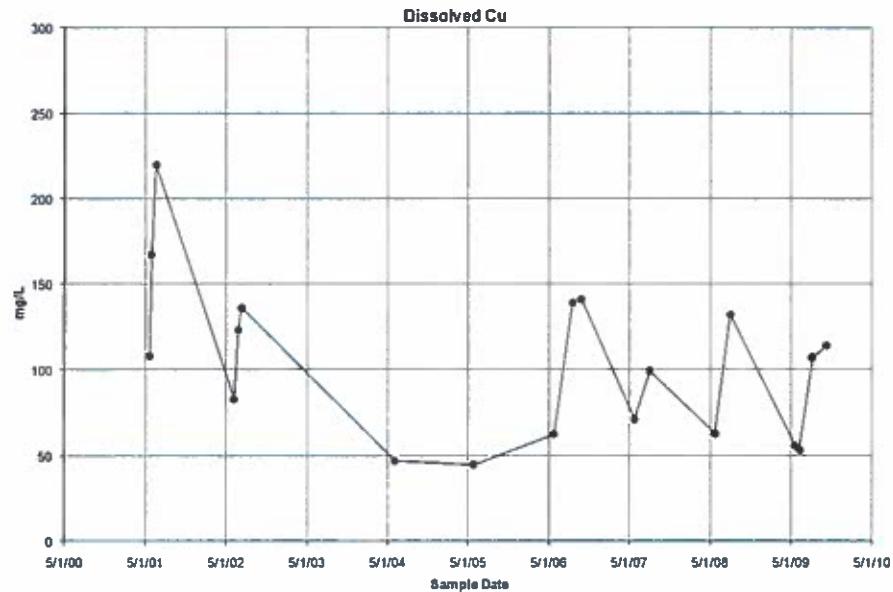
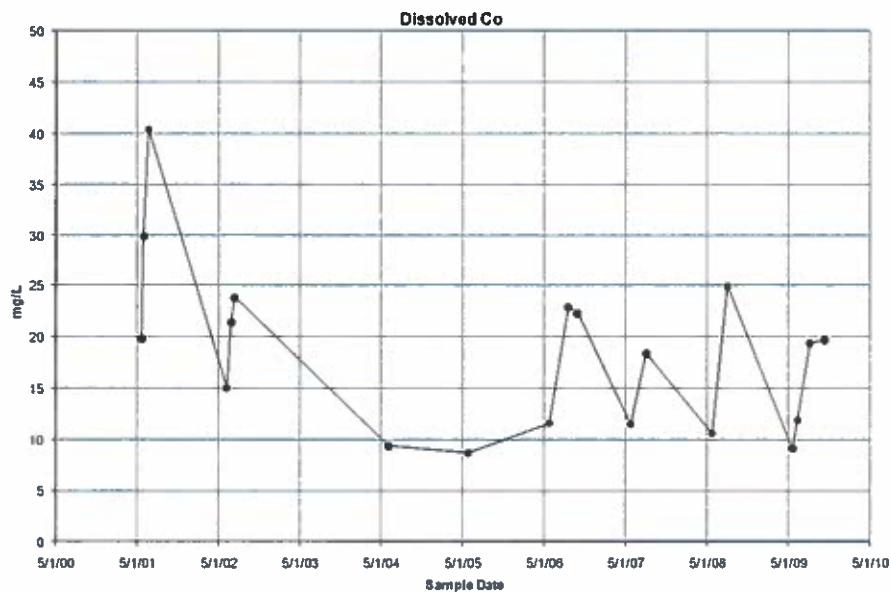
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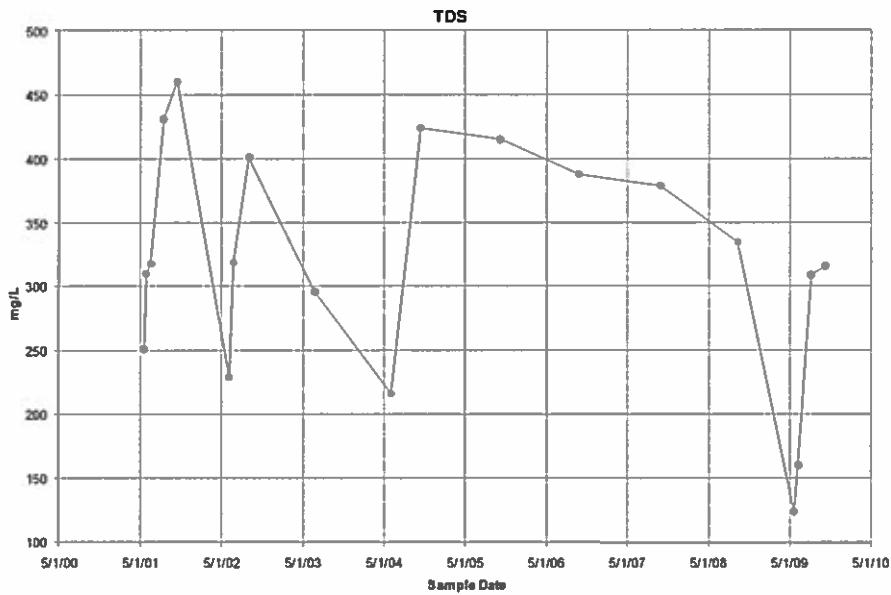
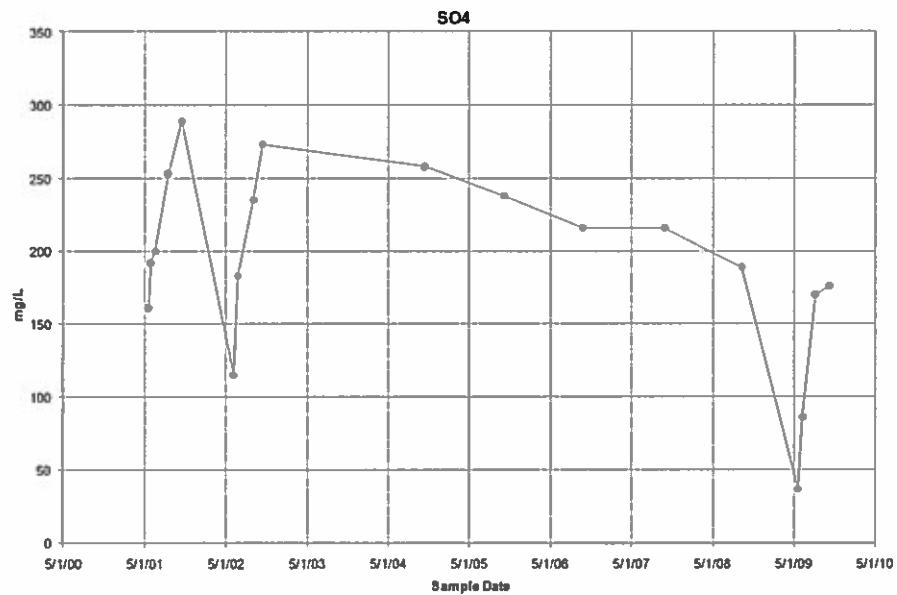
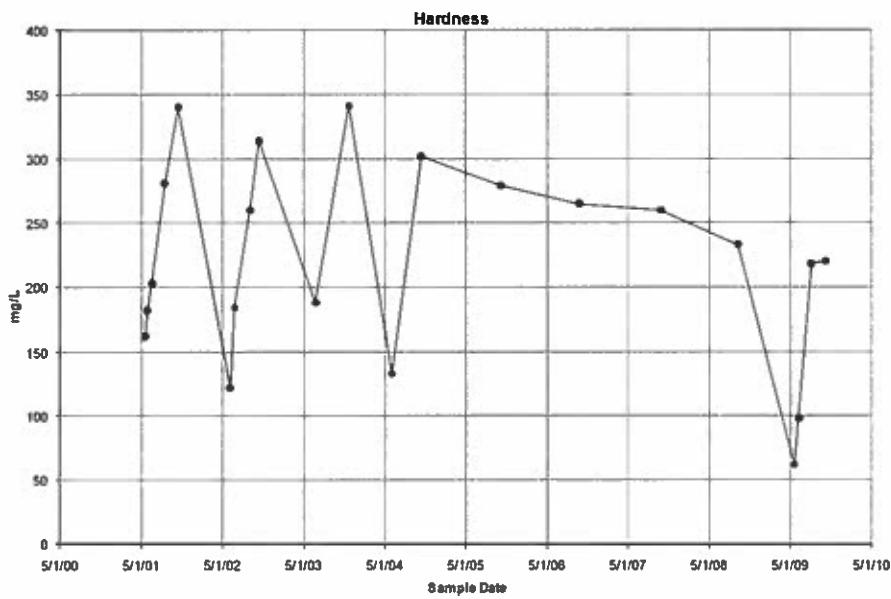
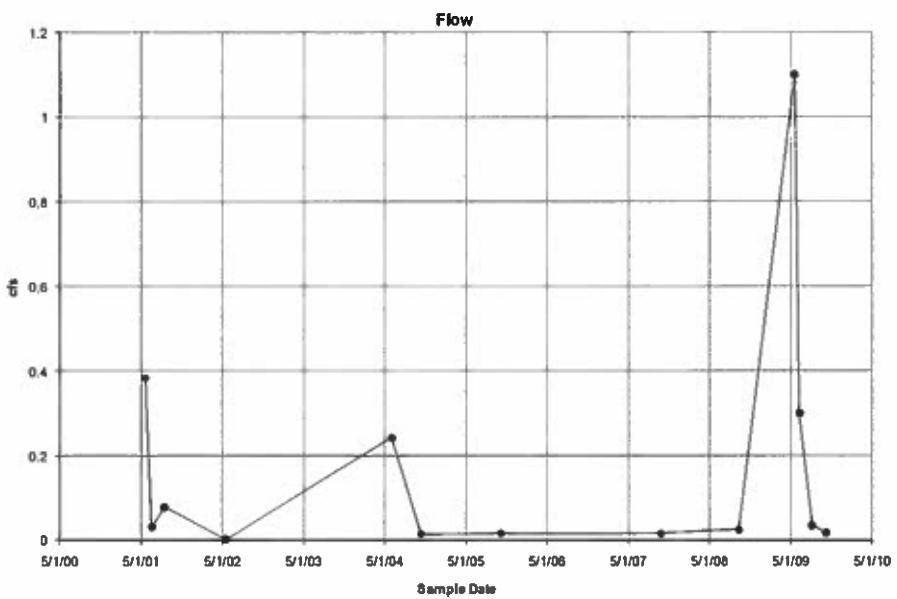
**FIGURE 3-2b**







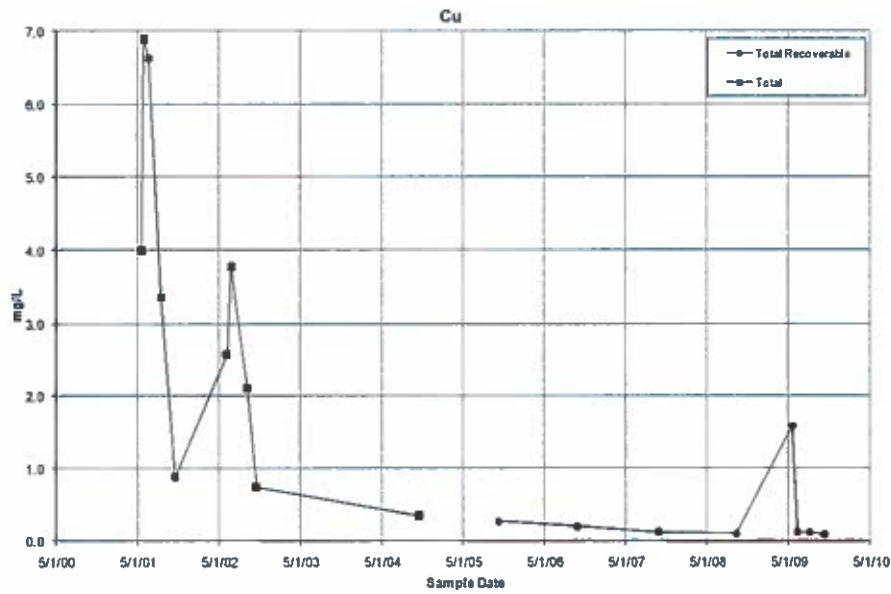
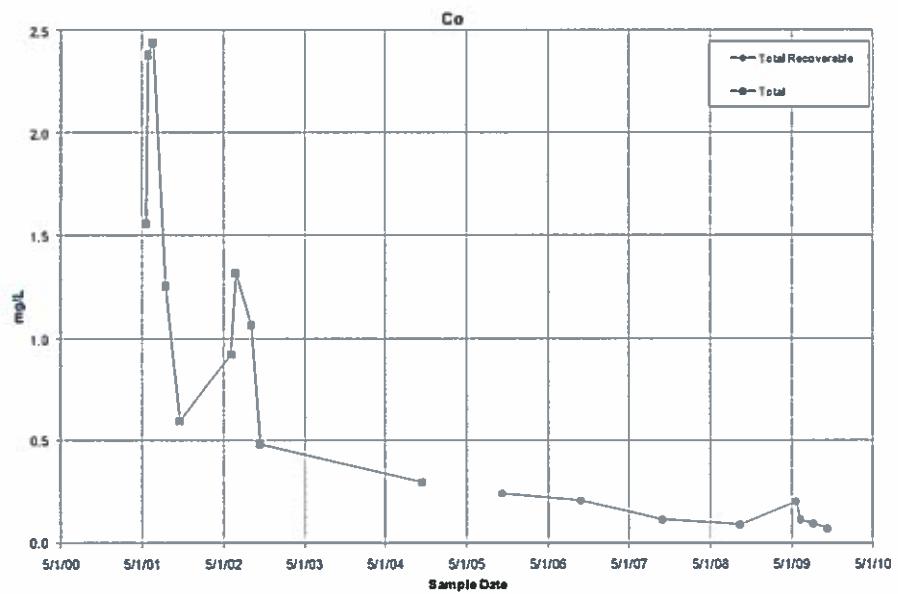
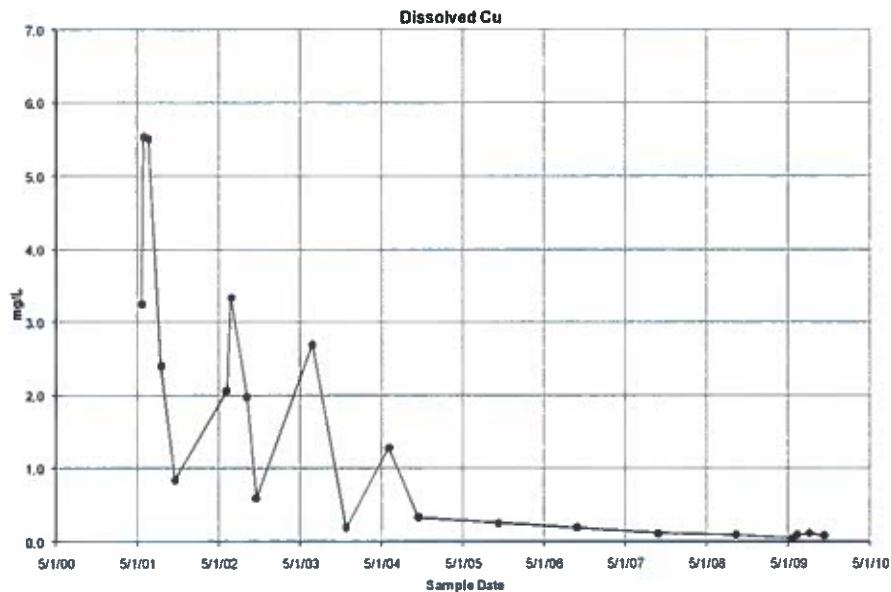
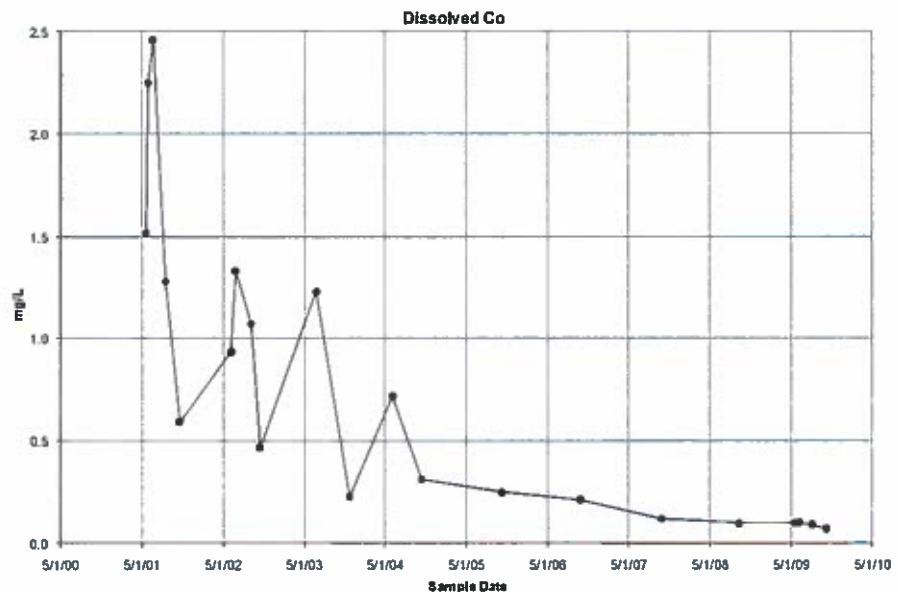




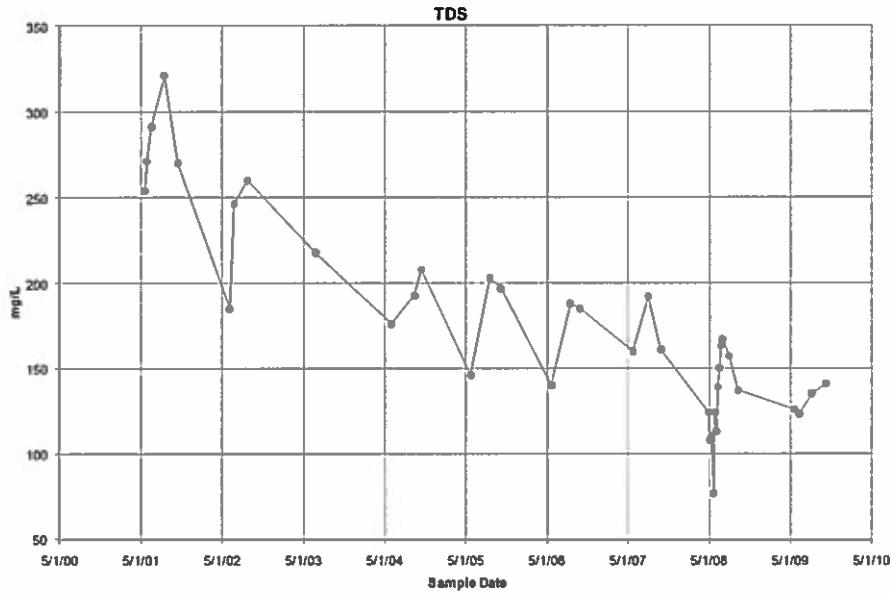
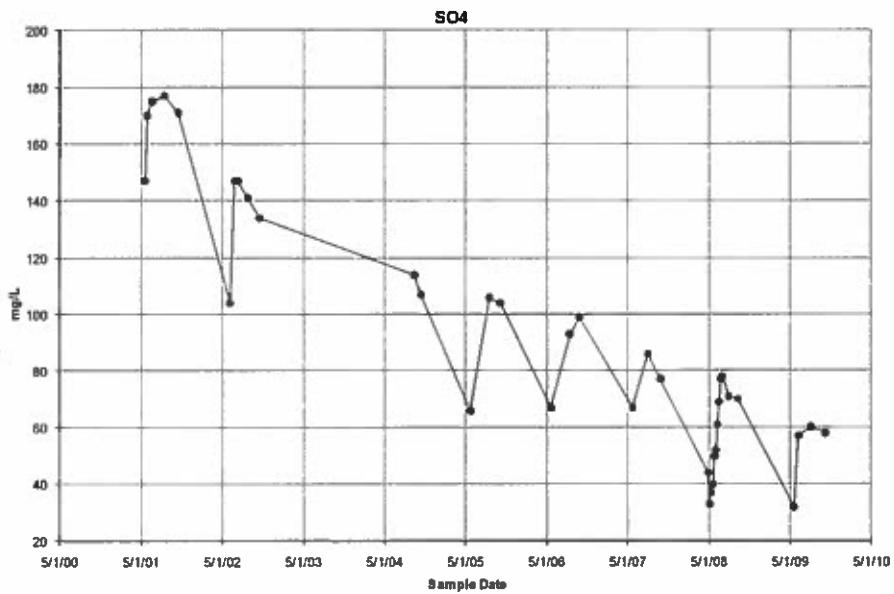
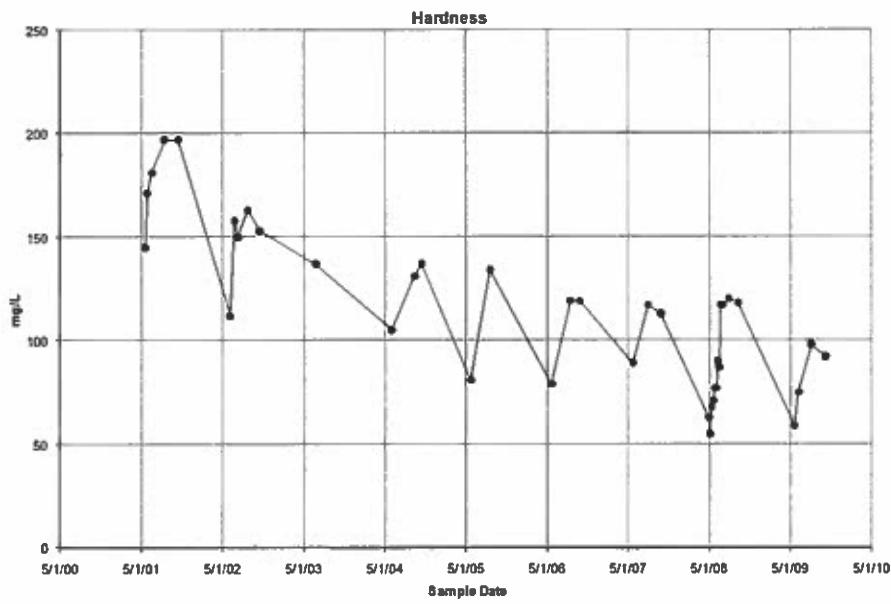
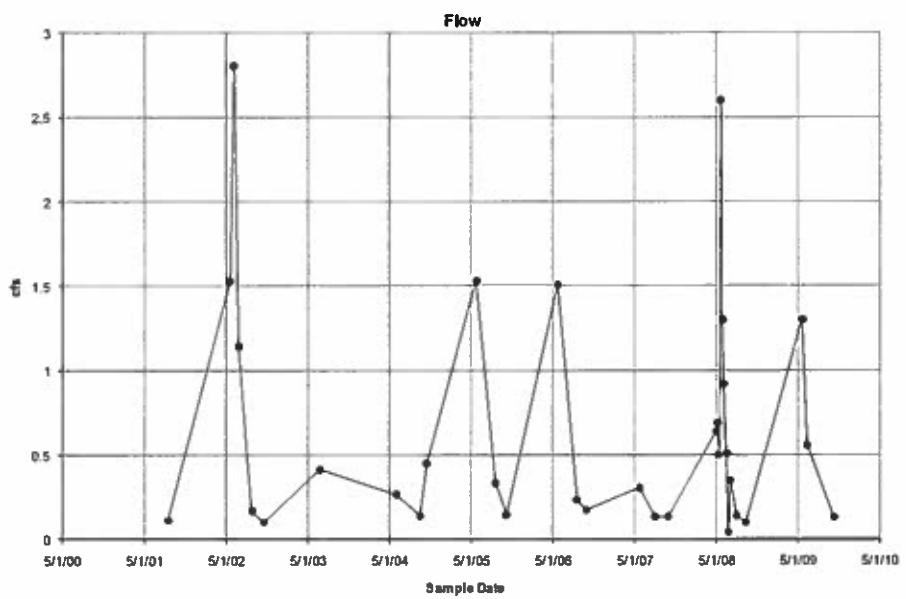
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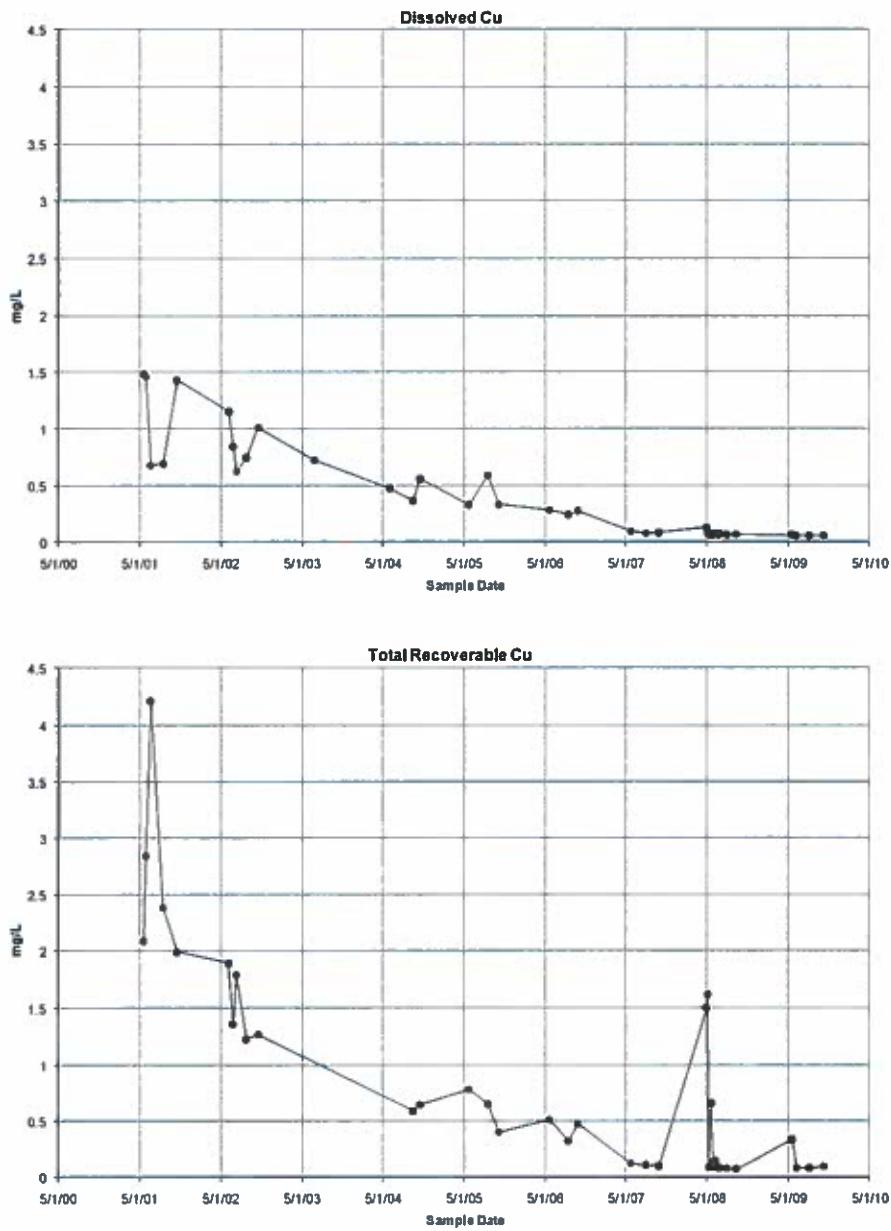
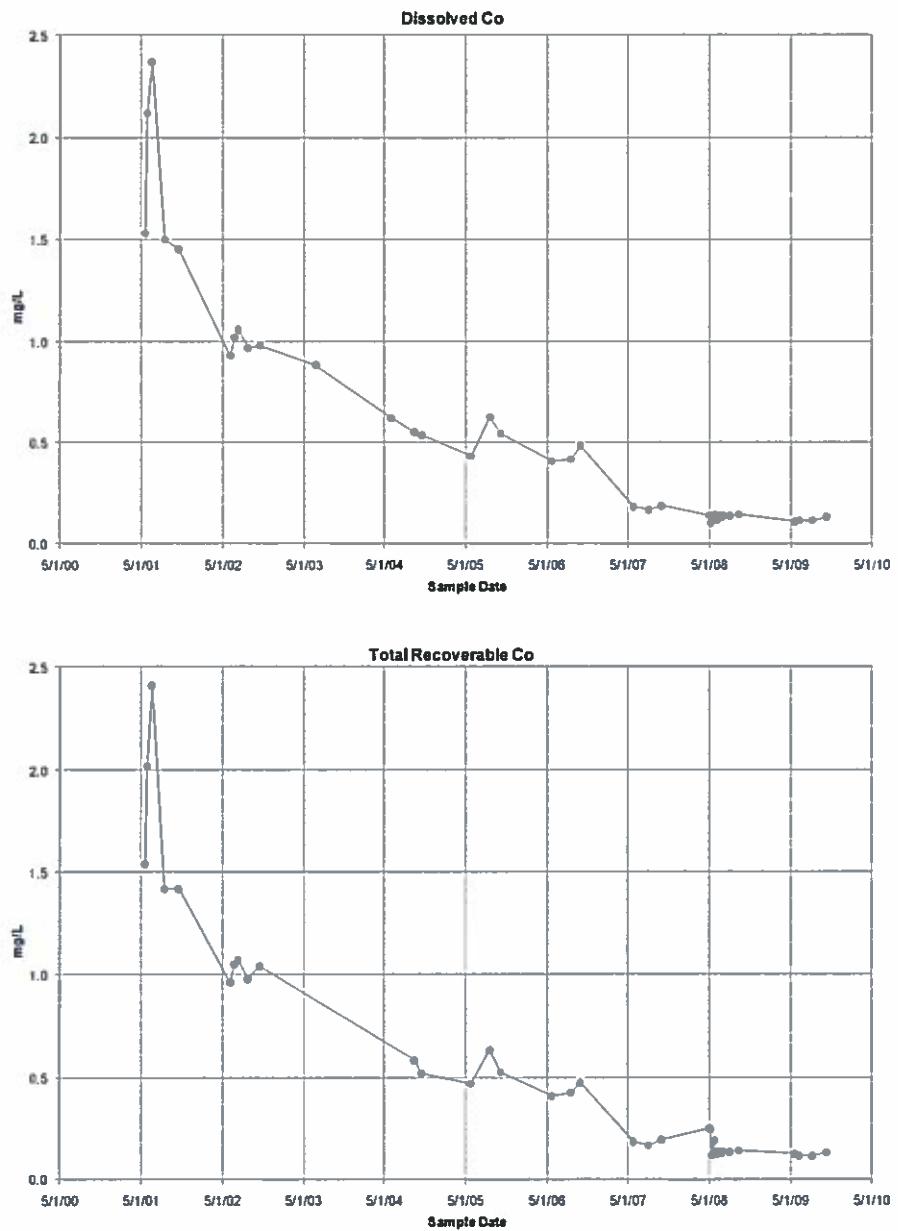
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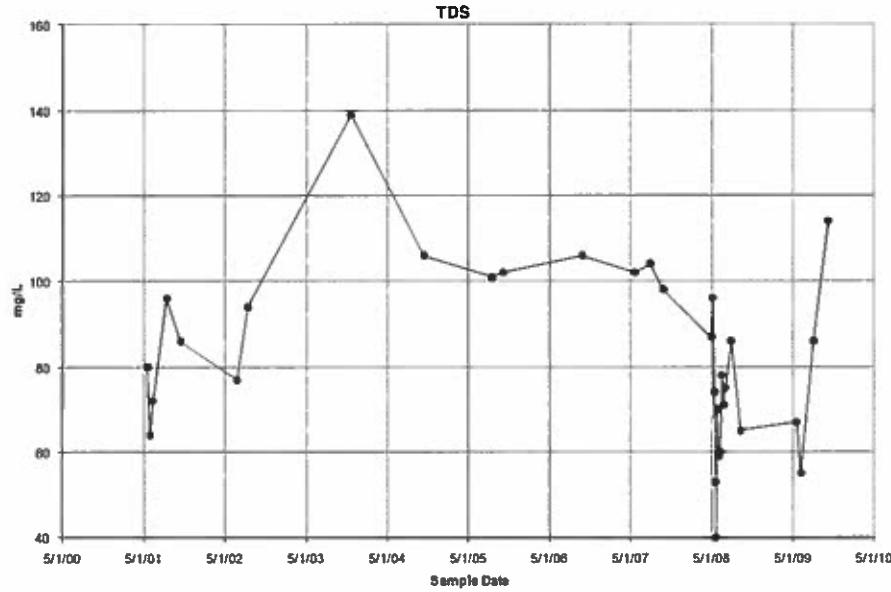
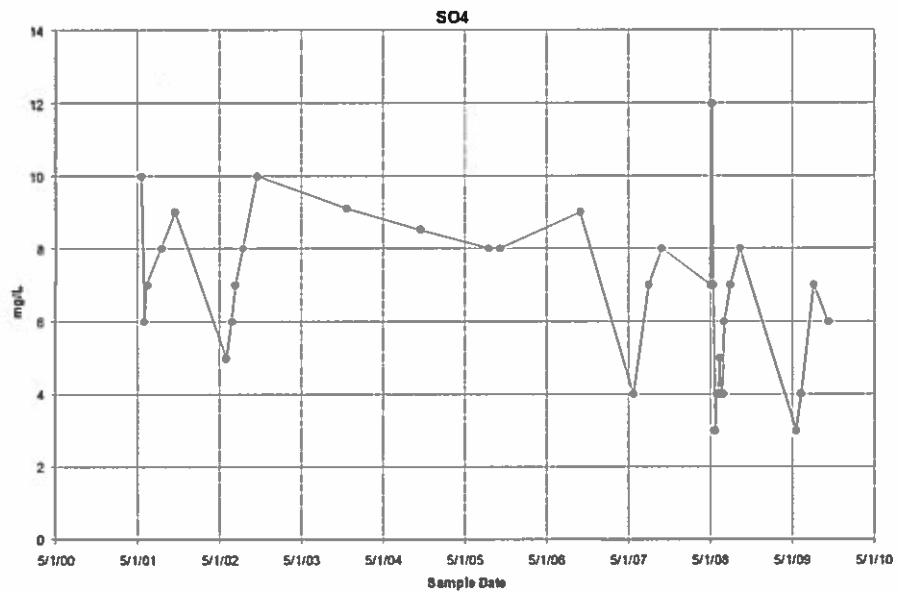
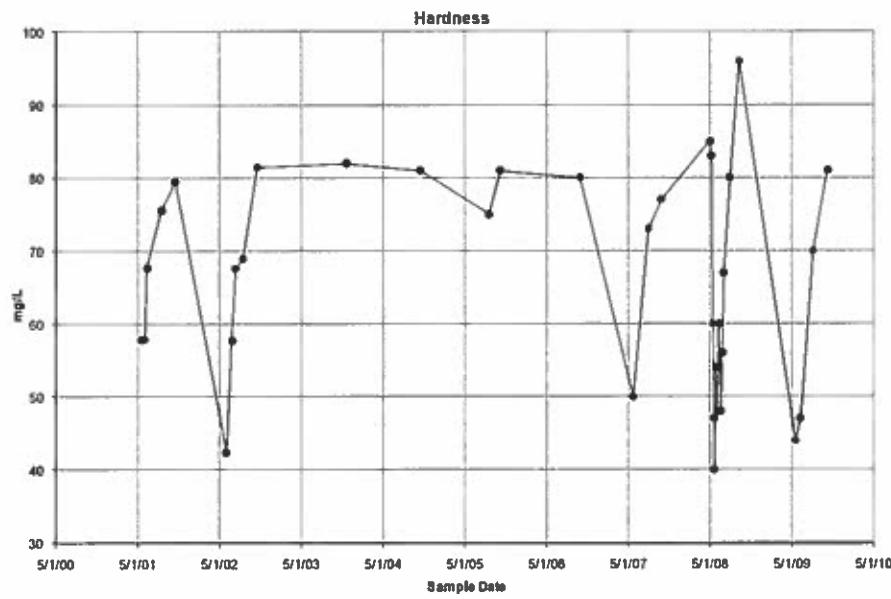
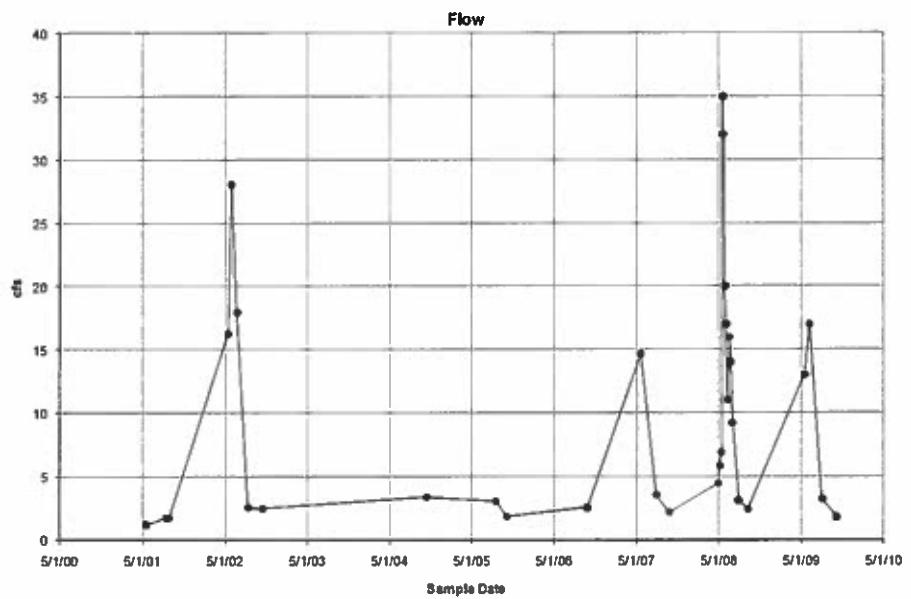
**FIGURE 3-5a**  
**2000 - 2009 DATA FOR SAMPLING LOCATION WQ-18**



**FIGURE 3-5b**  
**2000 - 2009 DATA FOR SAMPLING LOCATION WQ-18**



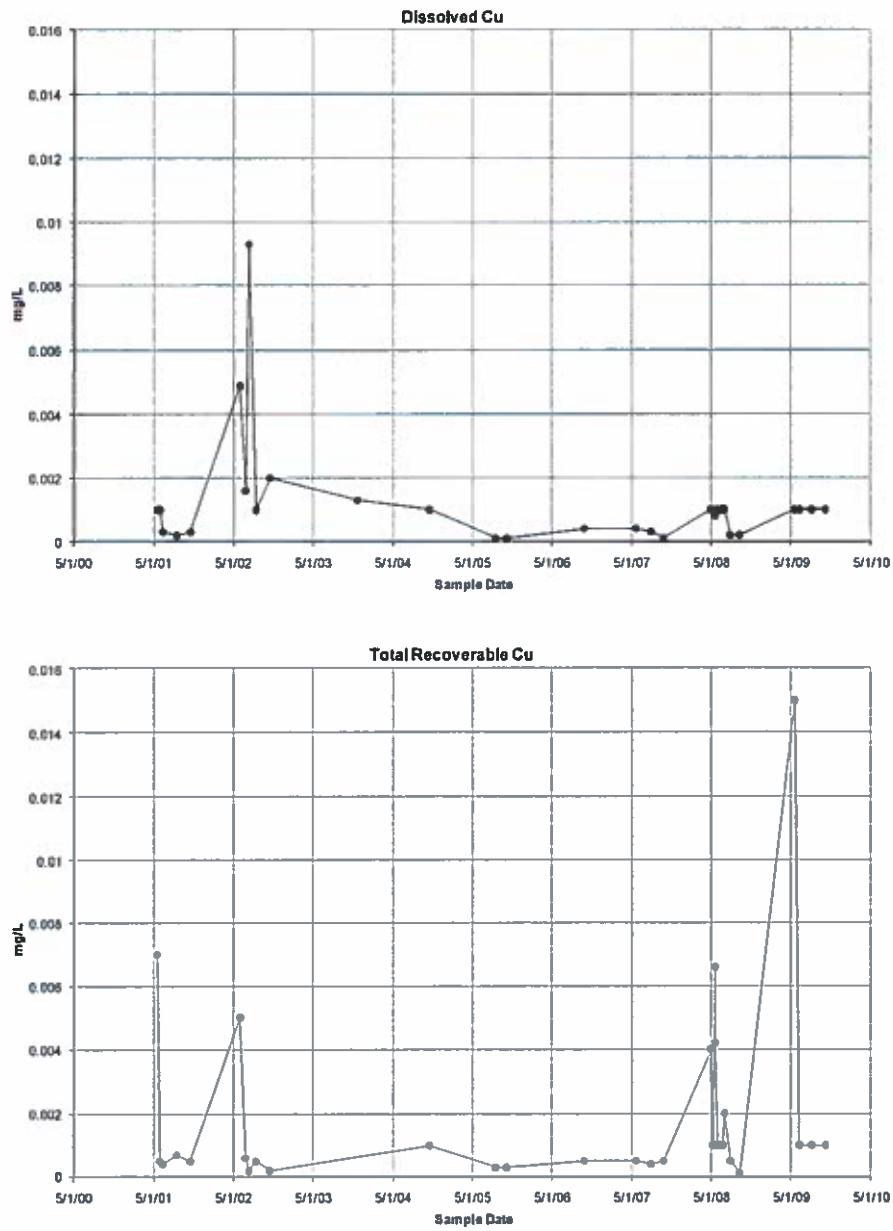
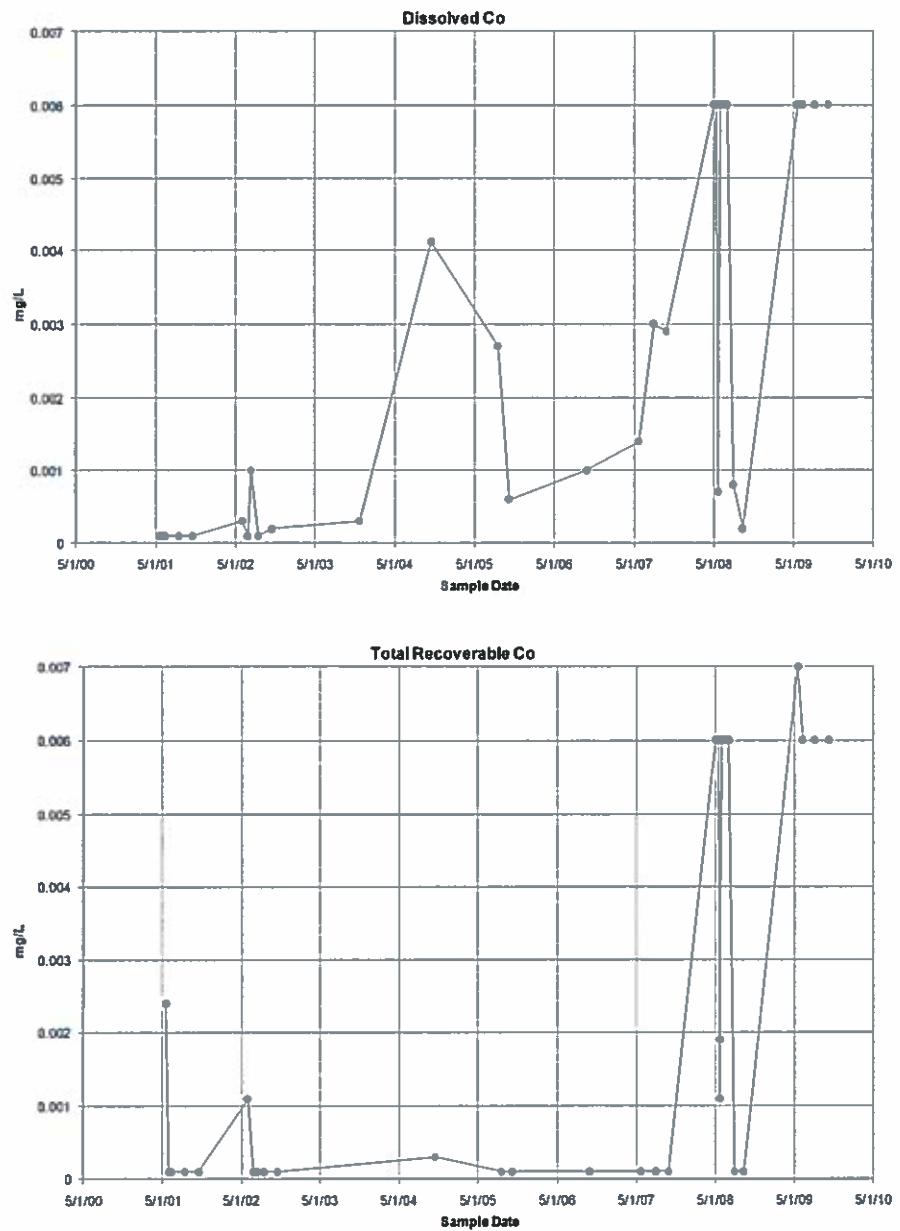


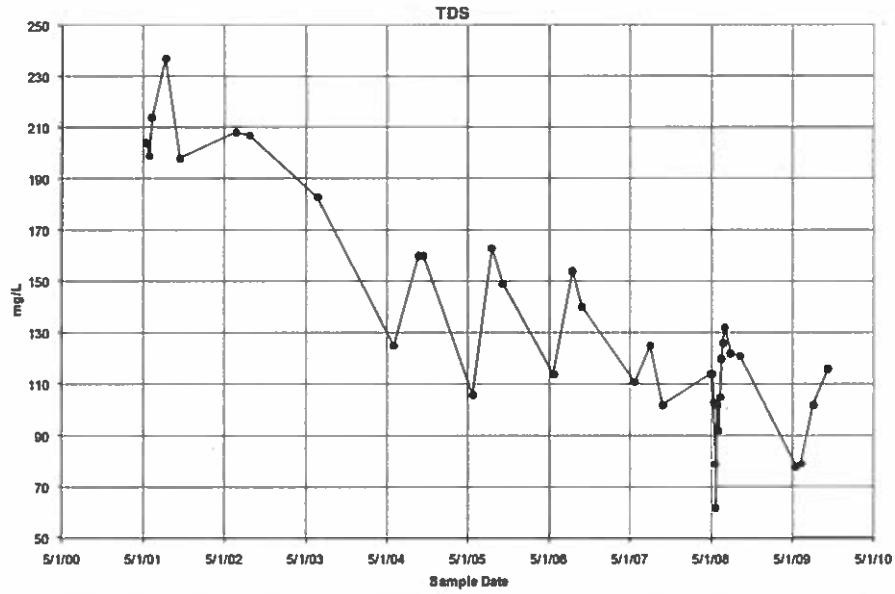
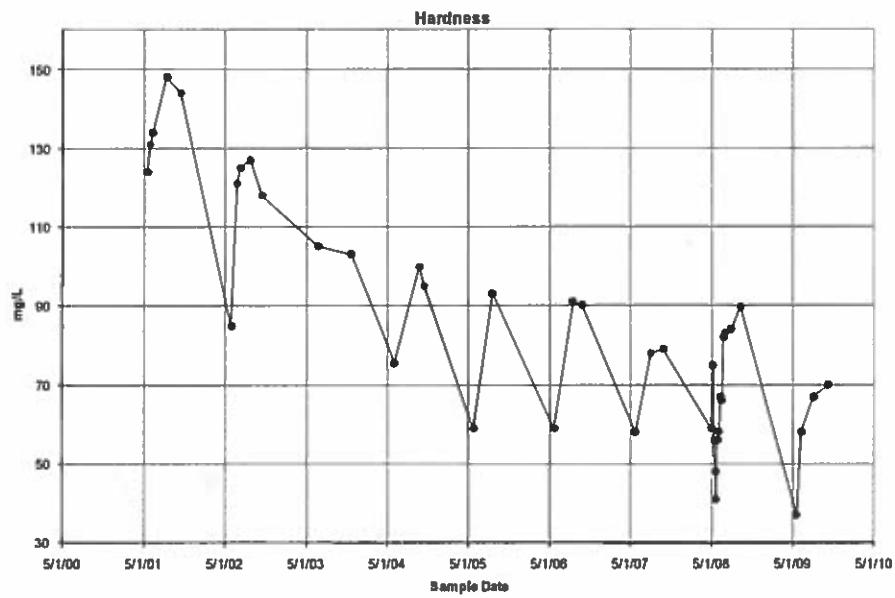
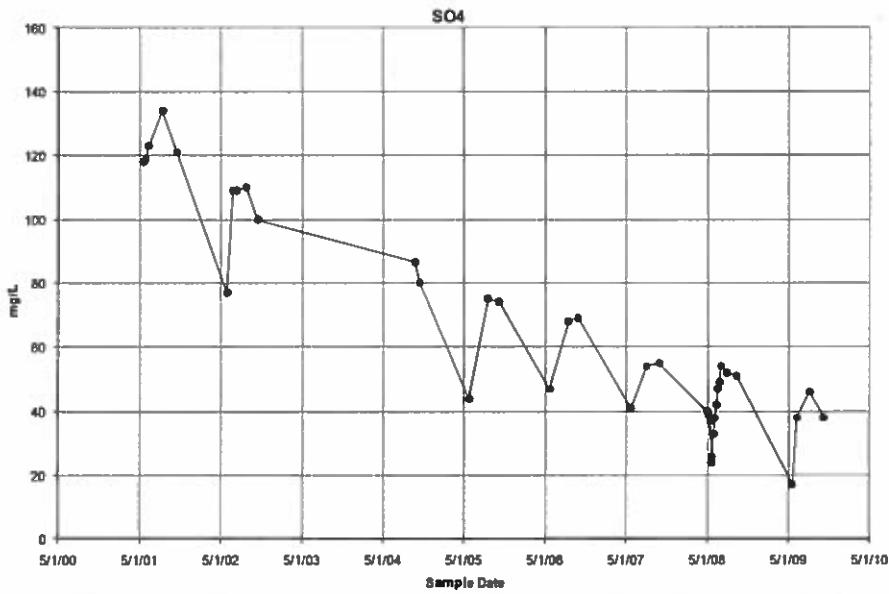
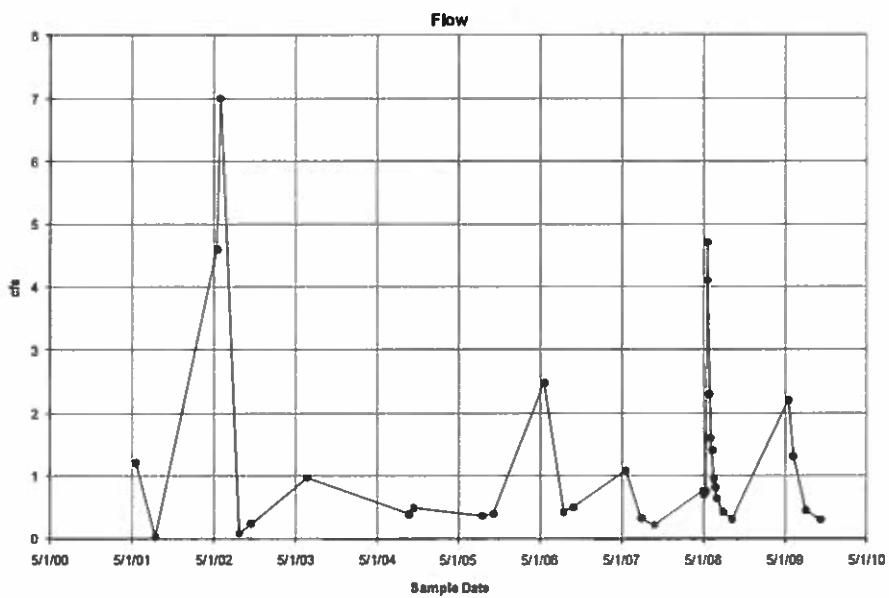


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**FIGURE 3-7a**  
**2000 - 2009 DATA FOR SAMPLING LOCATION WQ-20**

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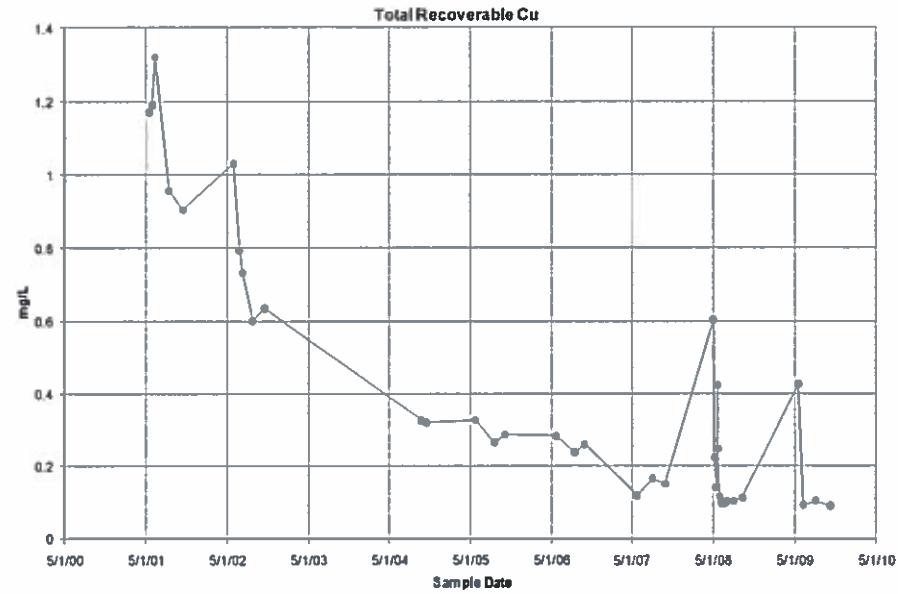
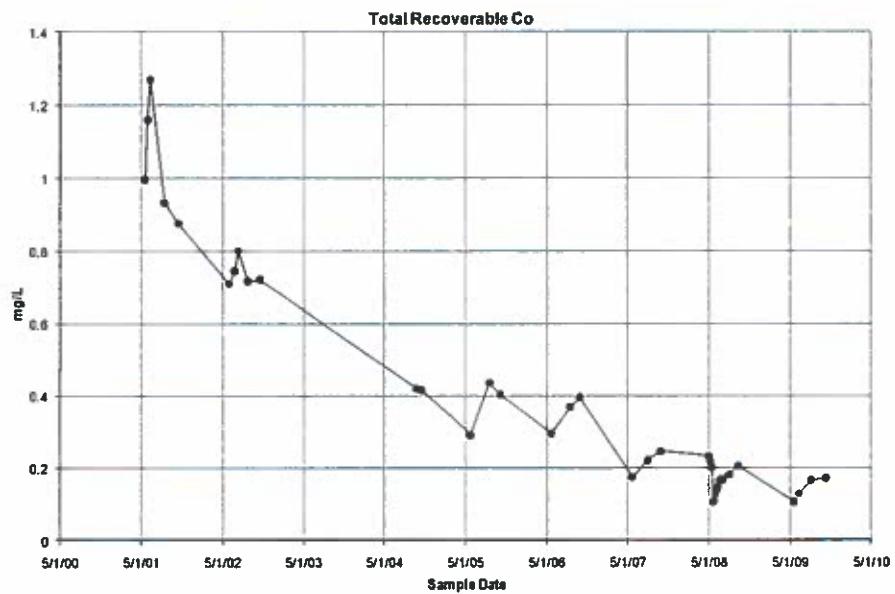
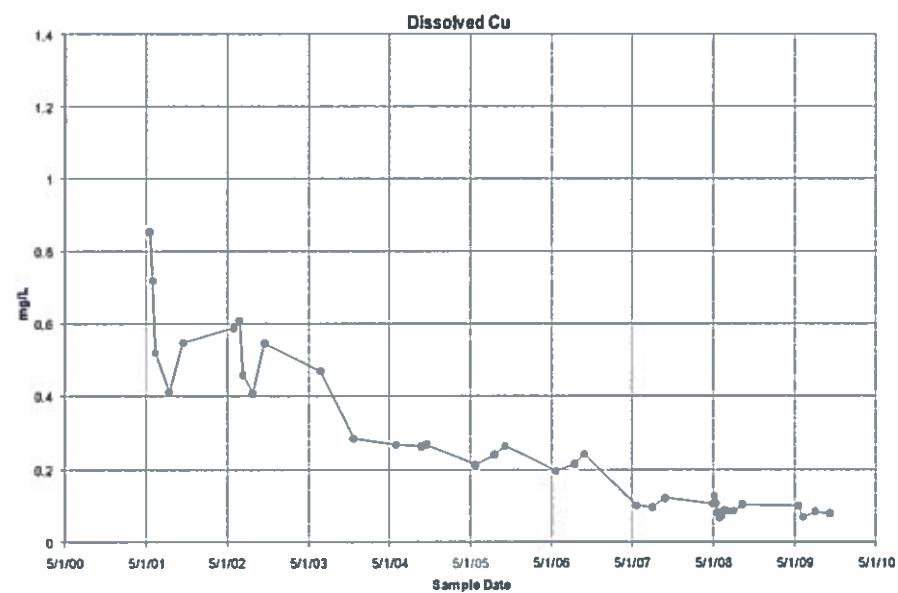
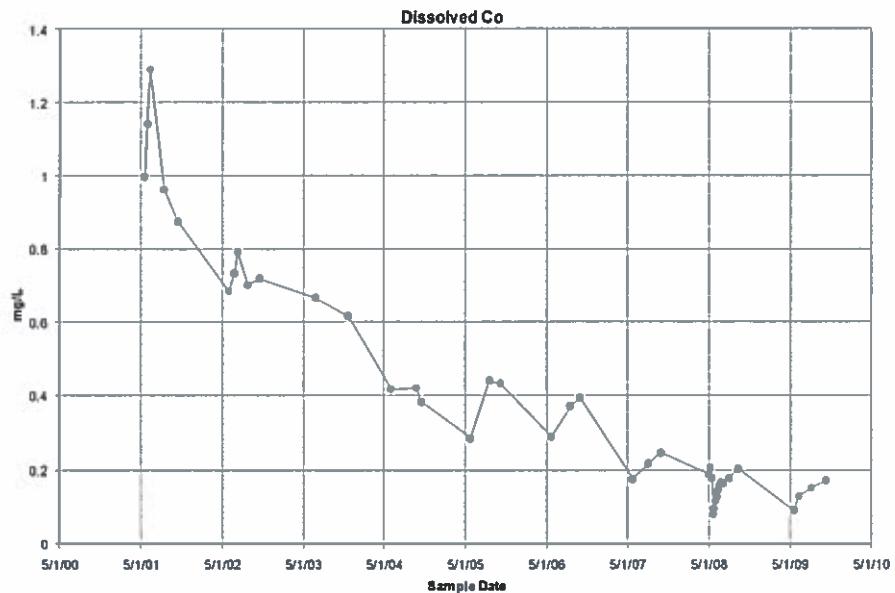


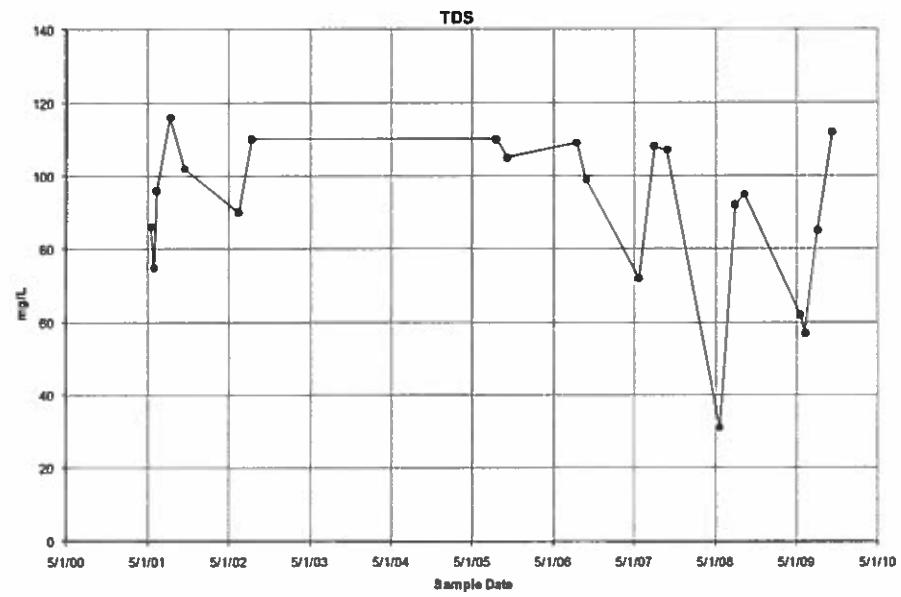
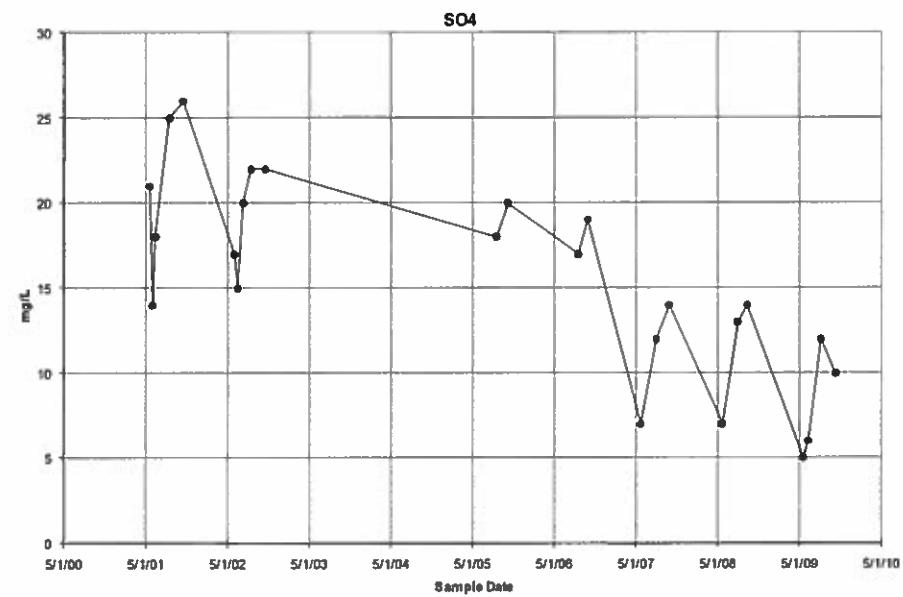
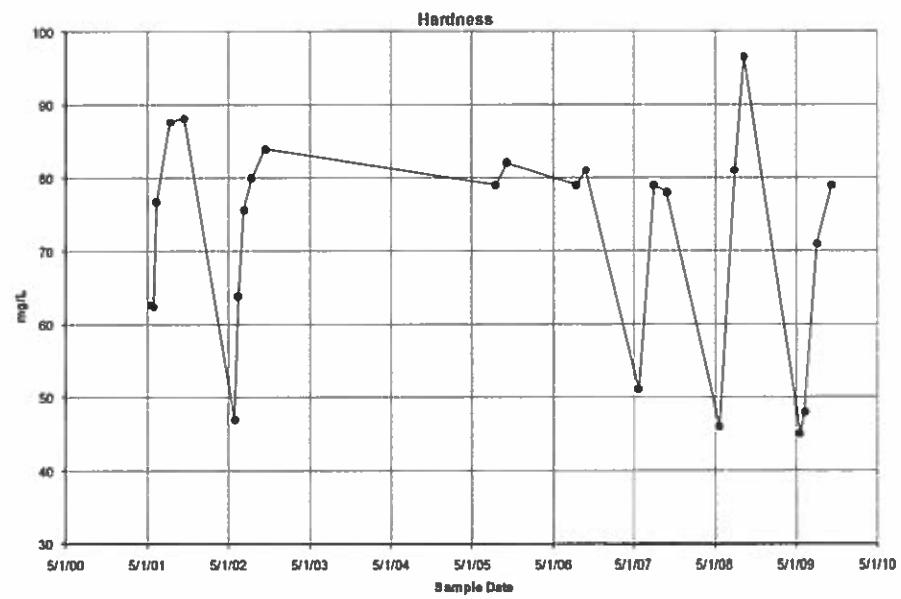
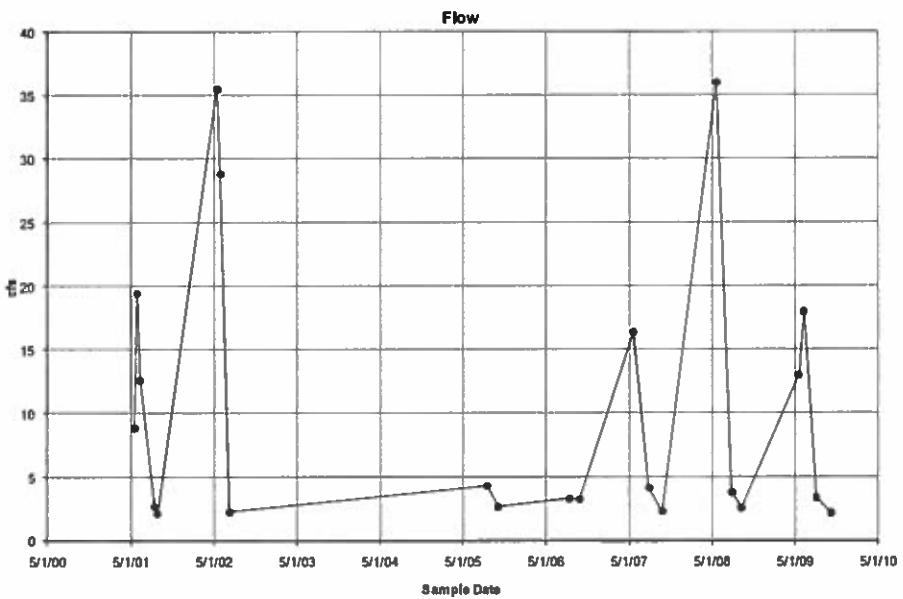


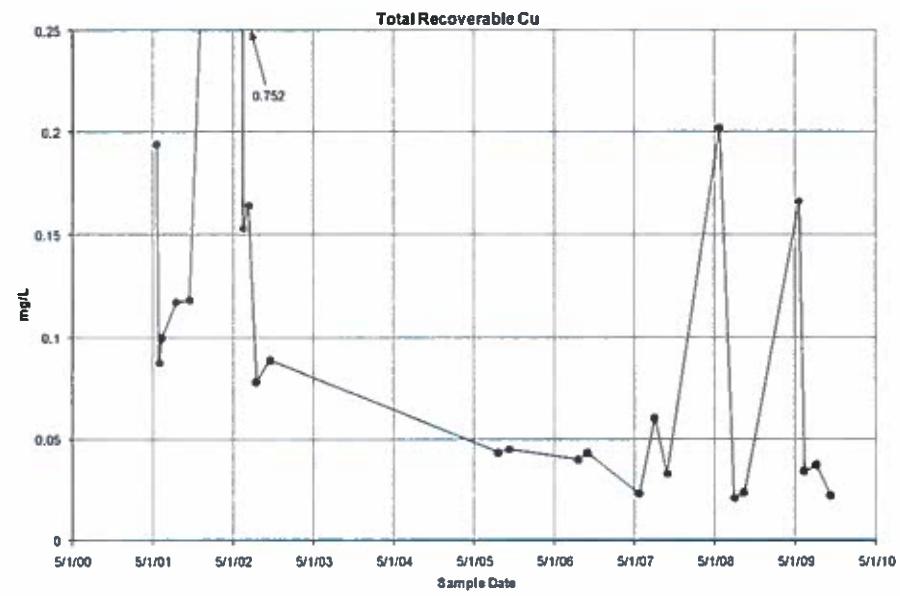
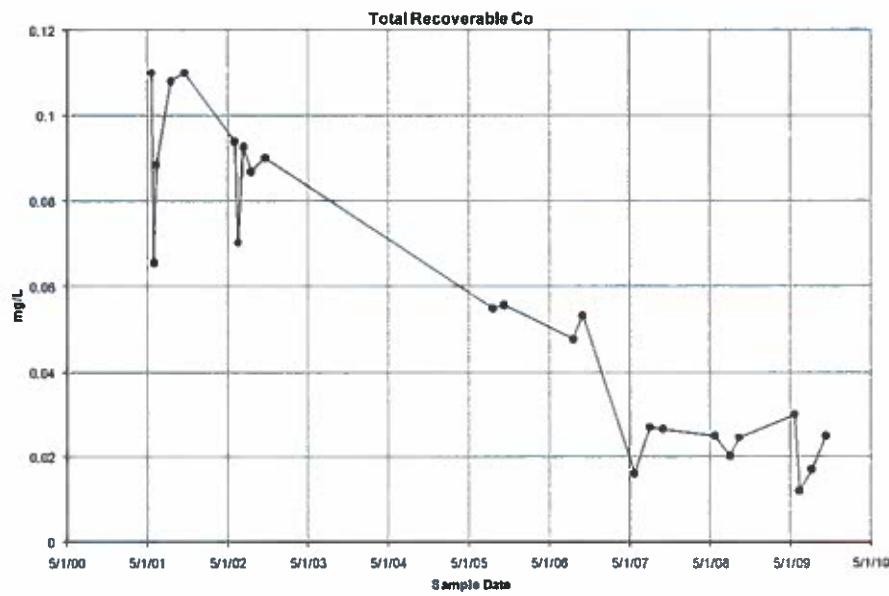
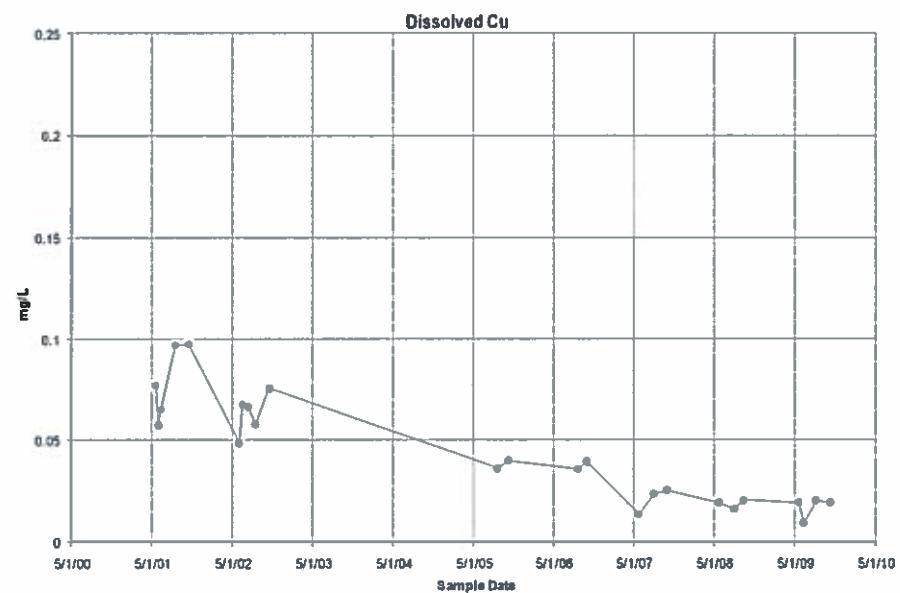
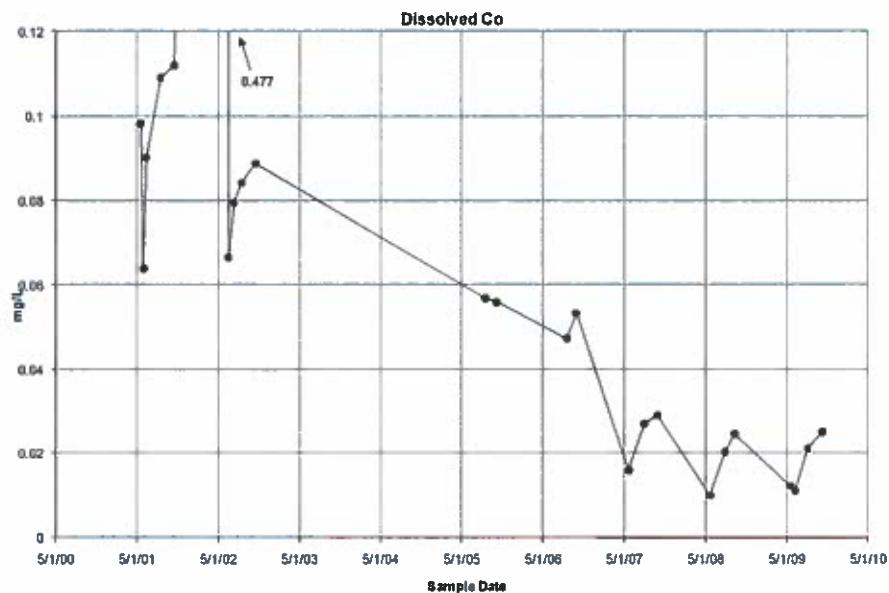
PROJECT:  
222100      TASK  
PREPARED BY:  
**TELESTO**  
SOLUTIONS, INCORPORATED

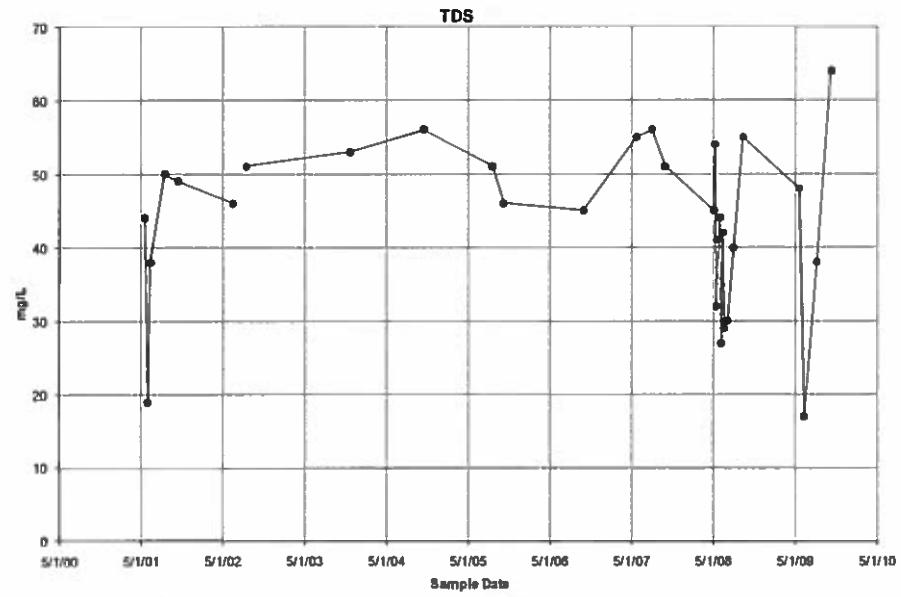
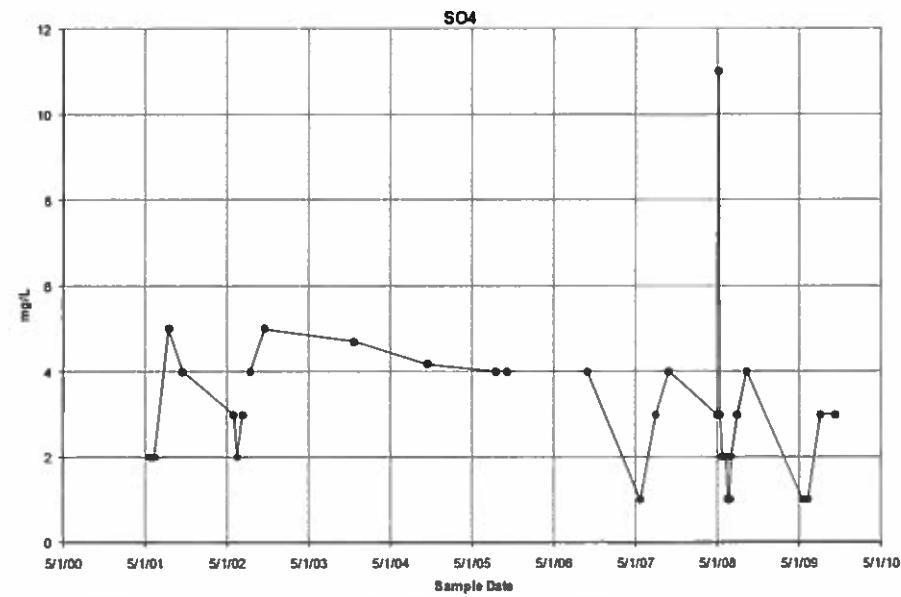
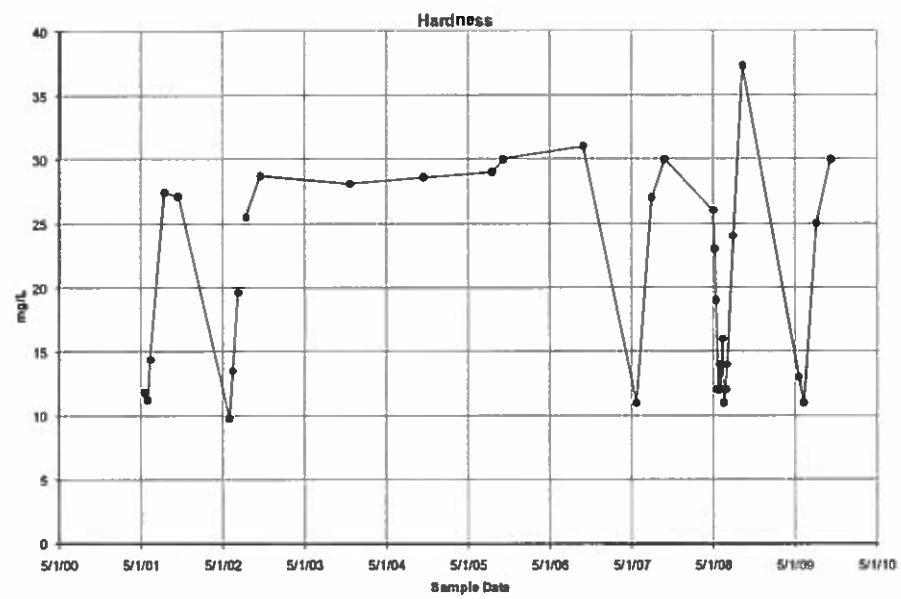
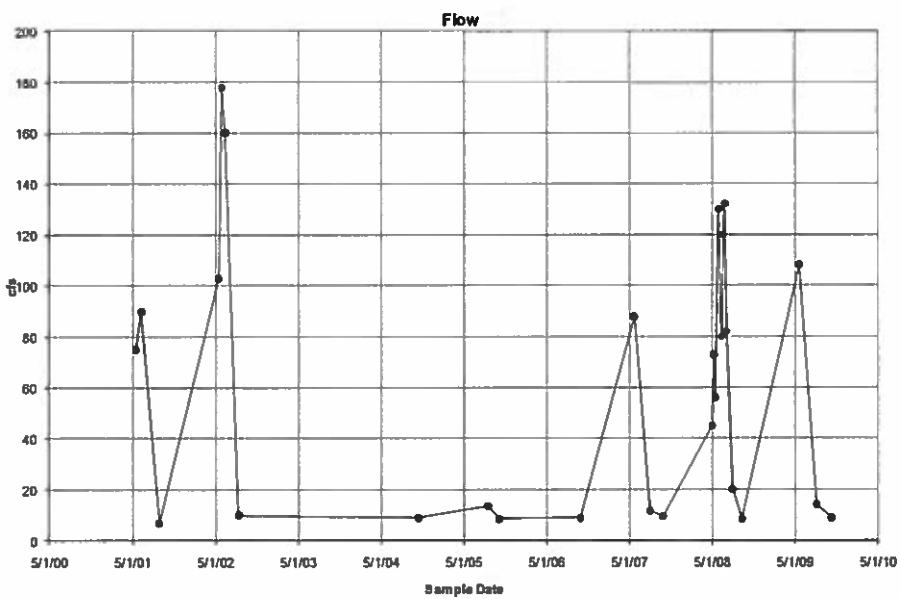
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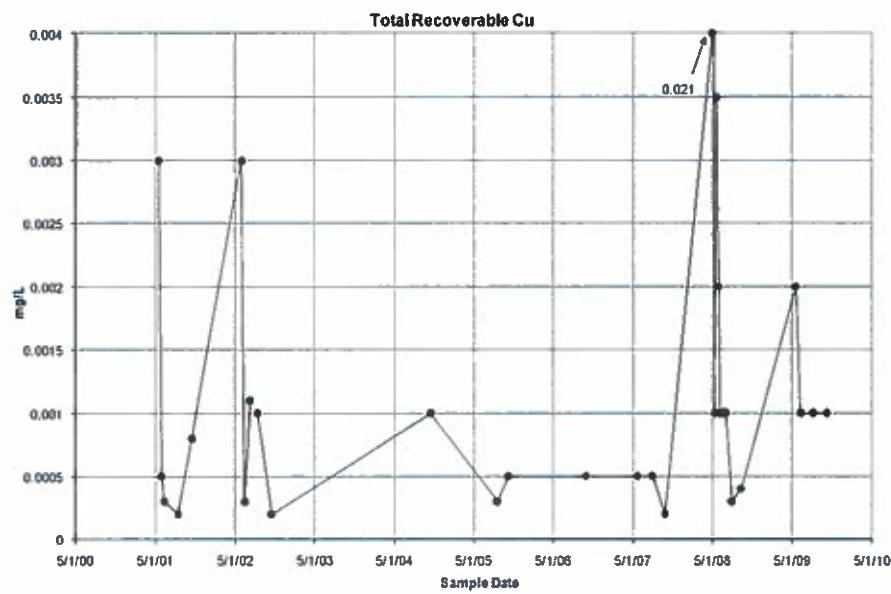
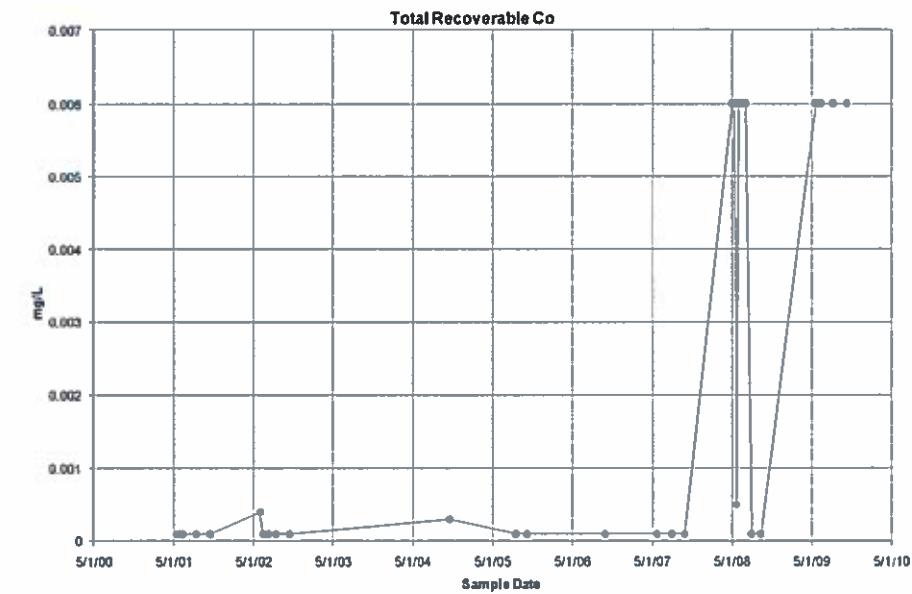
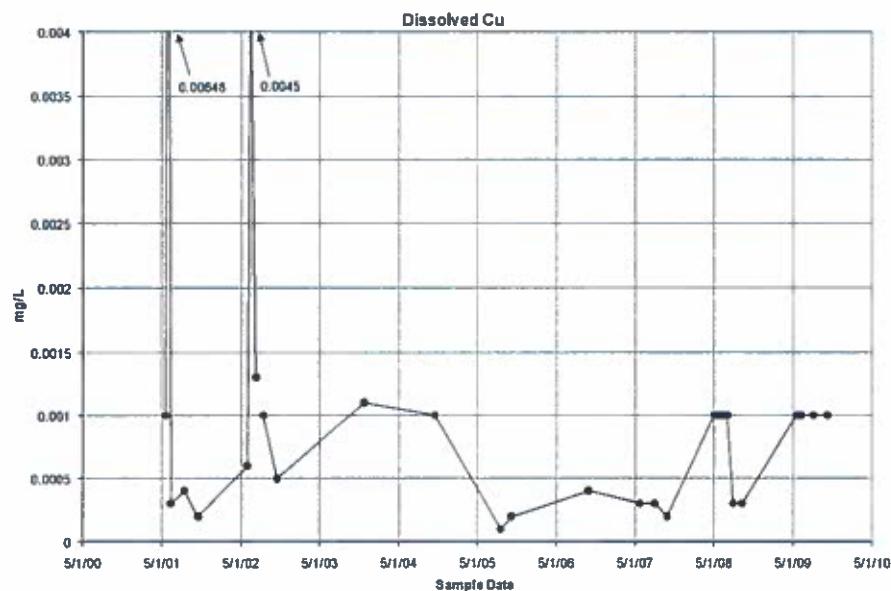
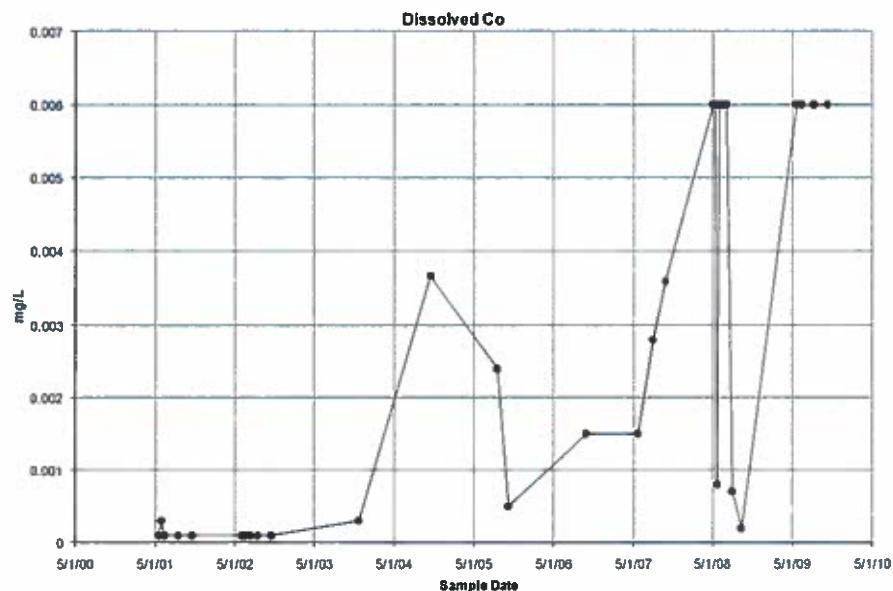
**FIGURE 3-8a**  
**2000 - 2009 DATA FOR SAMPLING LOCATION WQ-21**

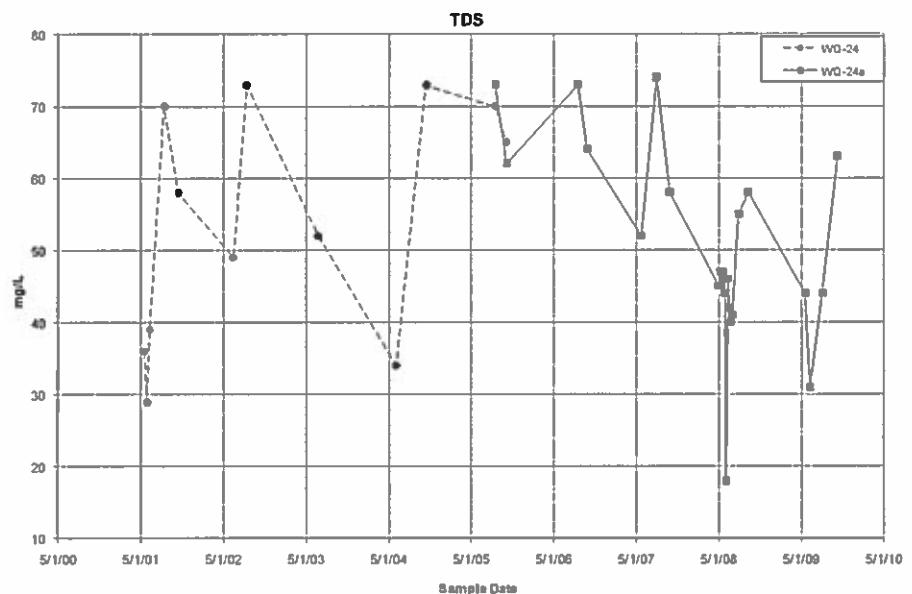
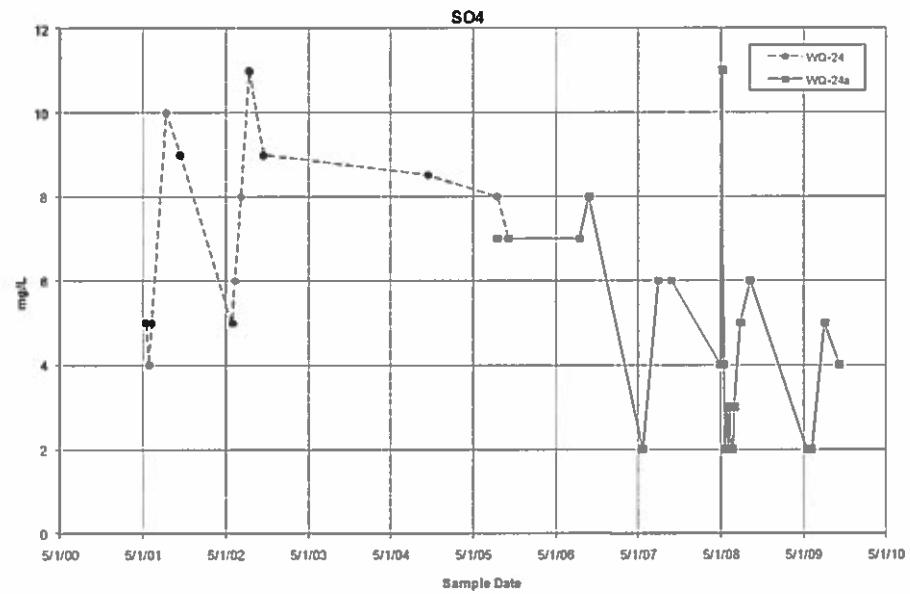
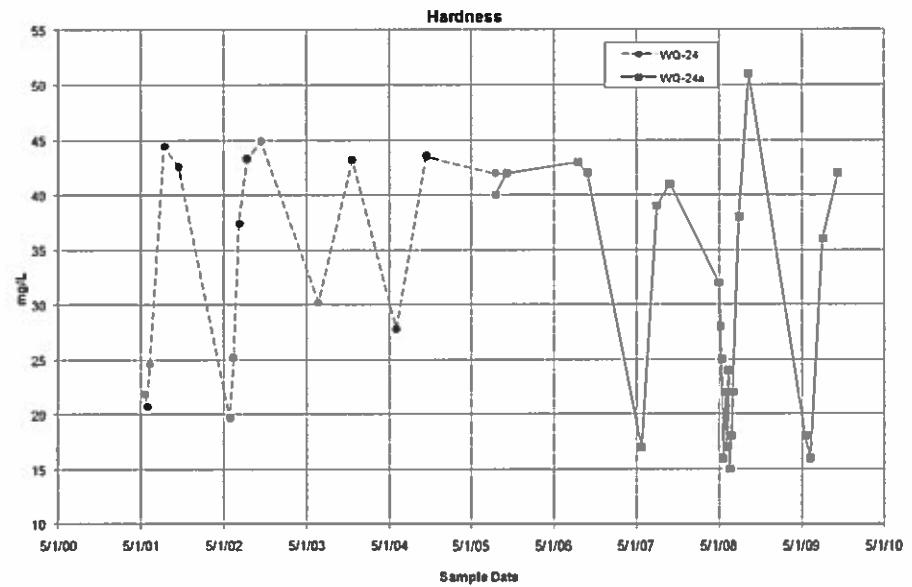
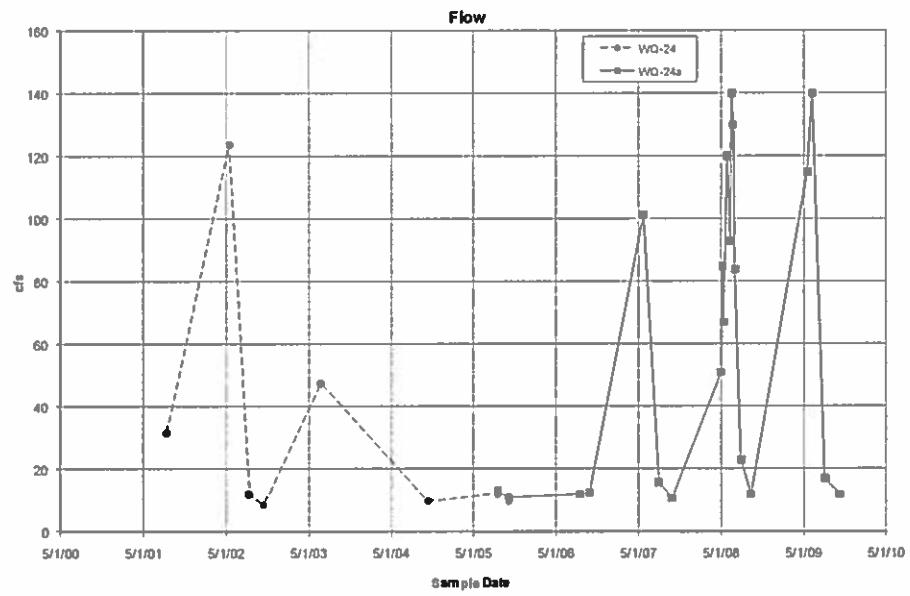




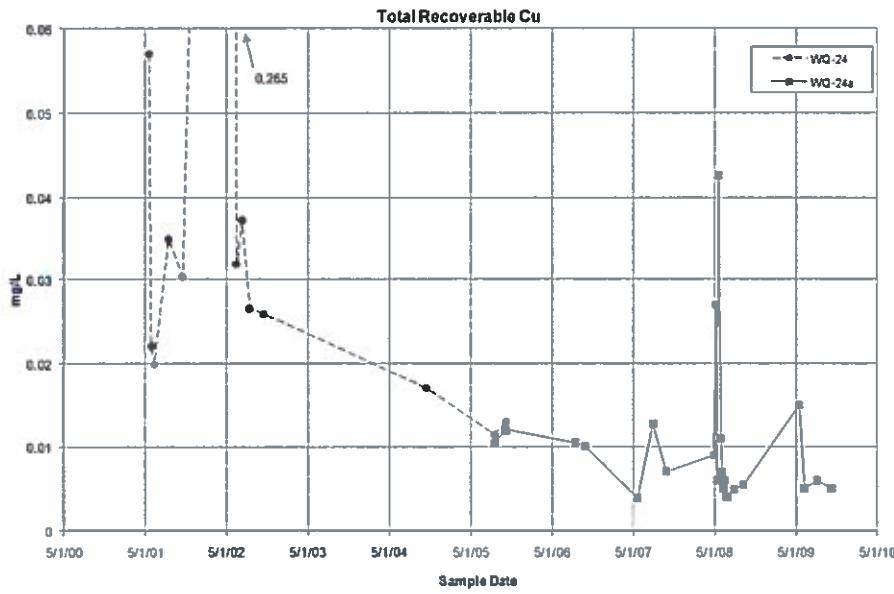
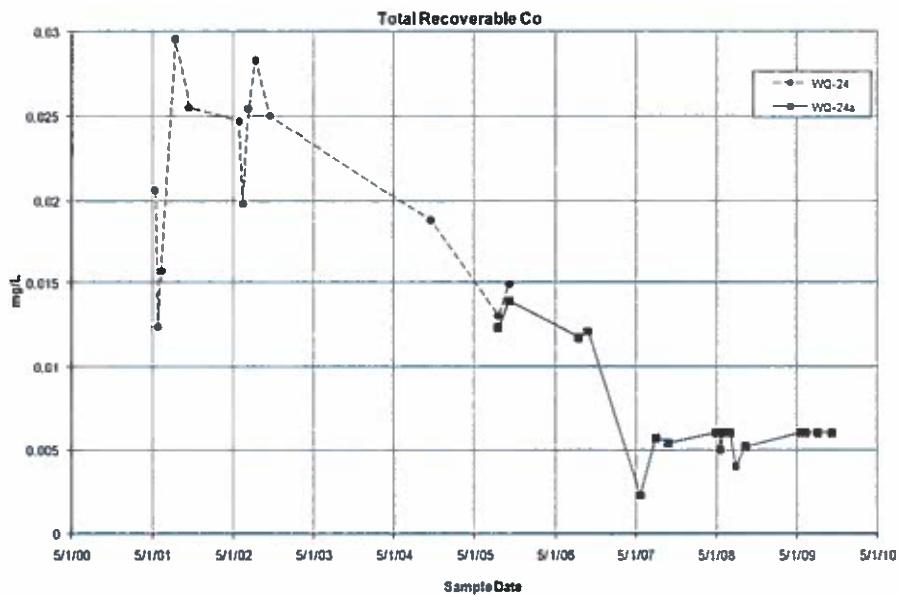
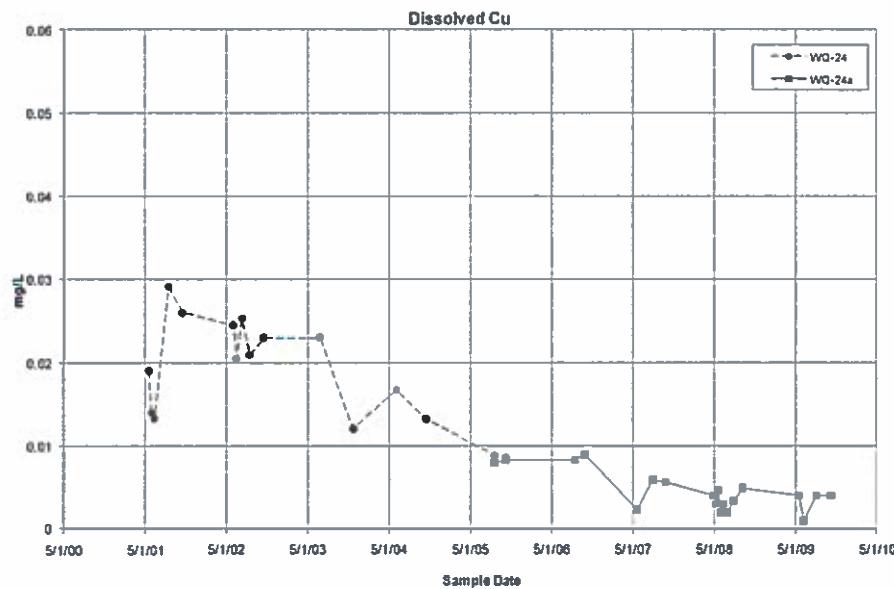
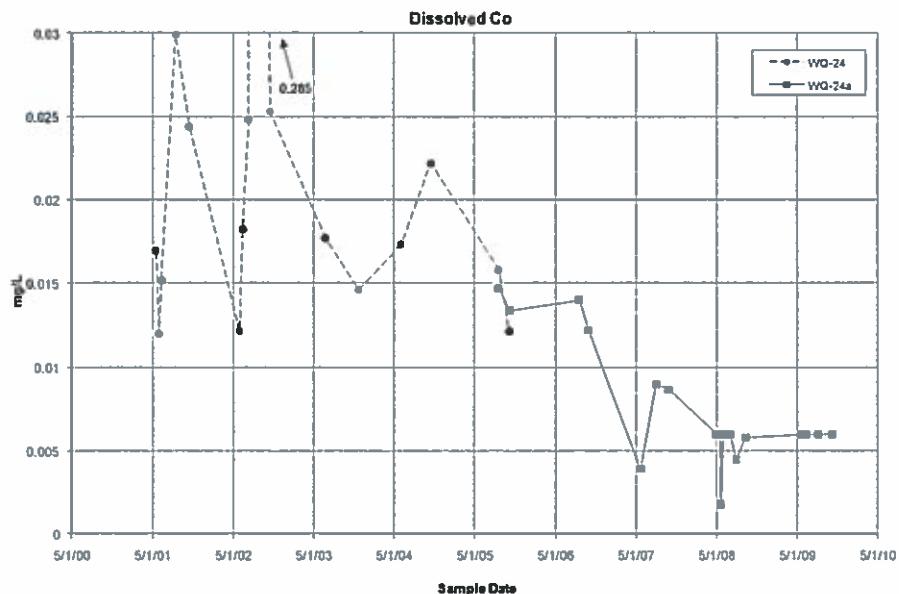


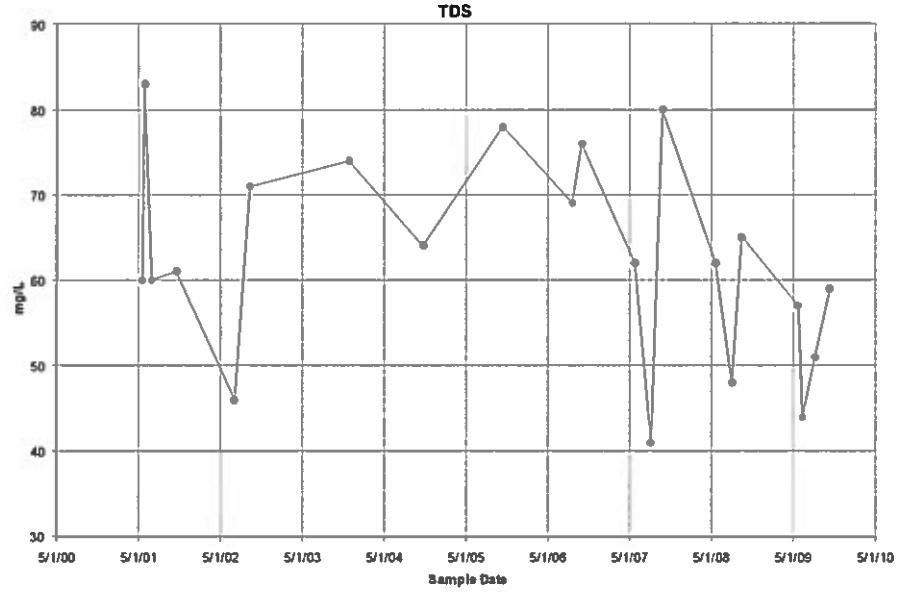
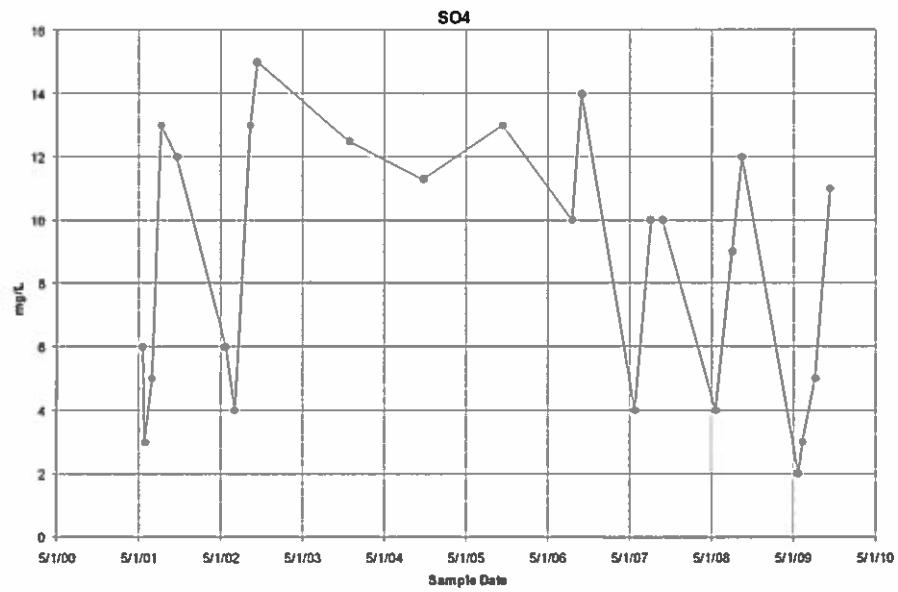
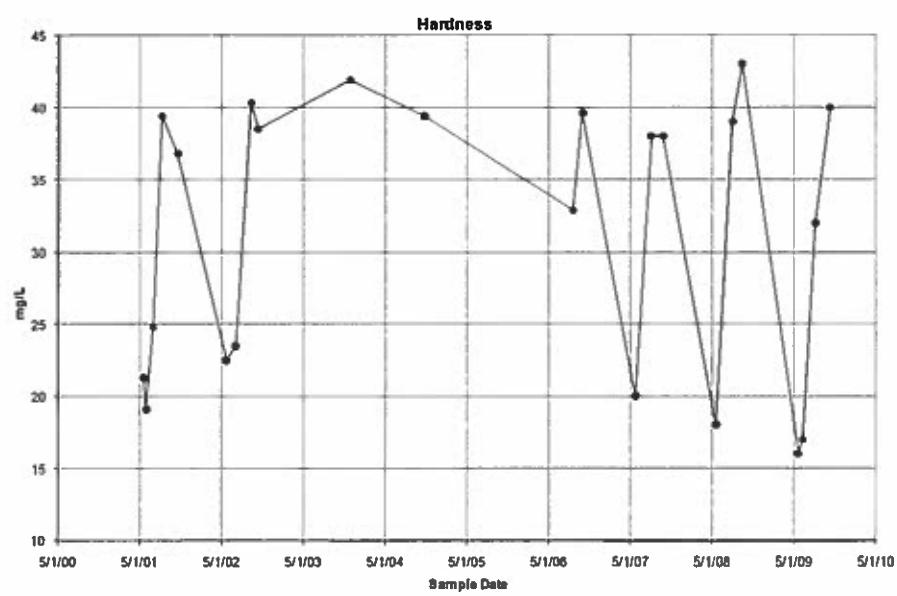
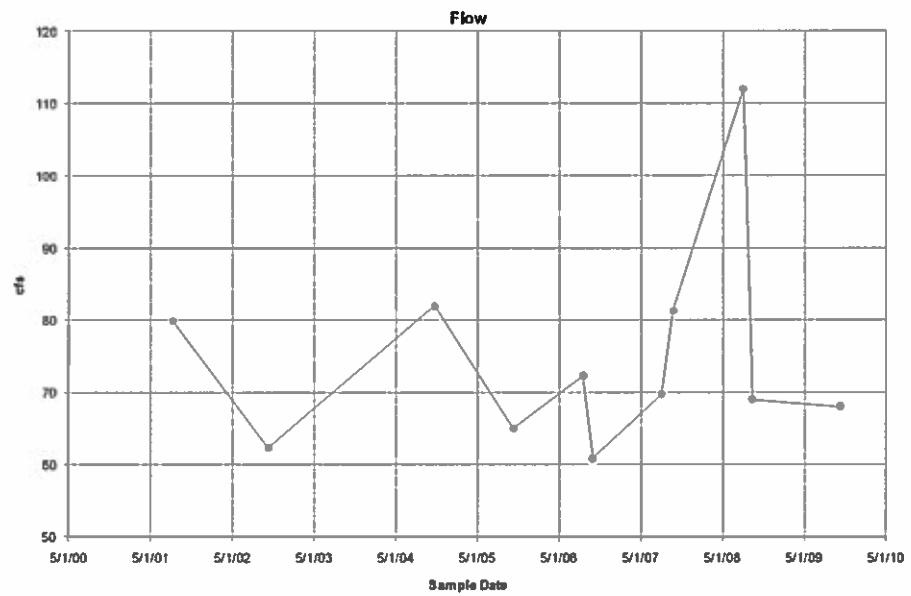


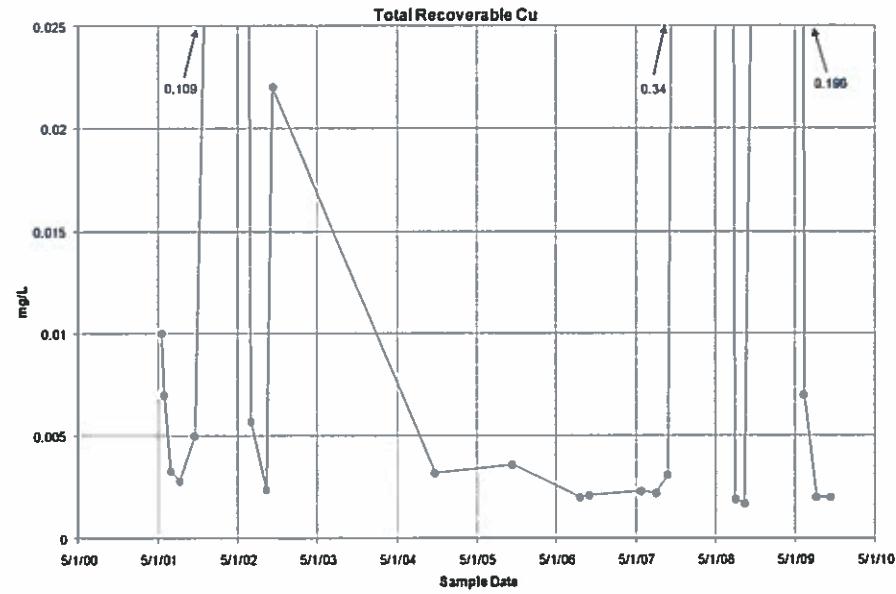
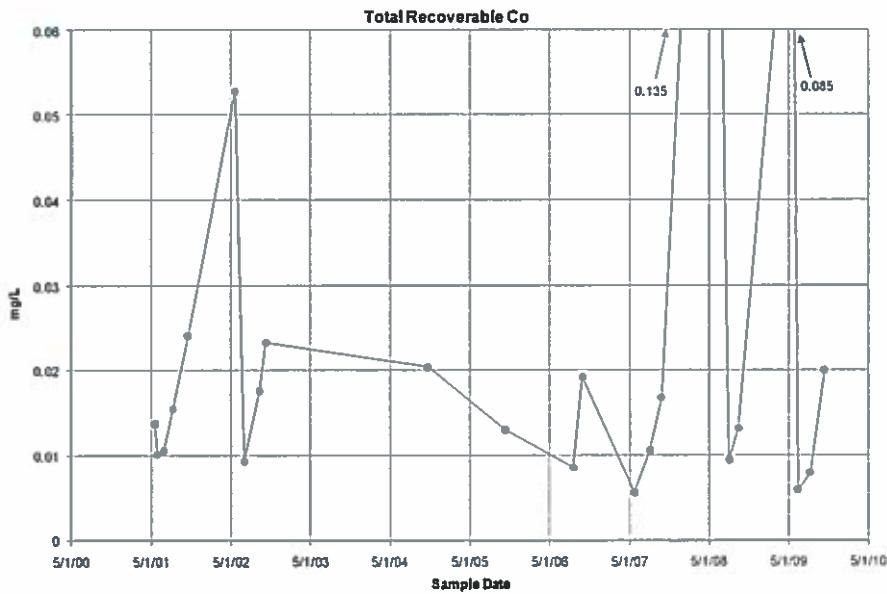
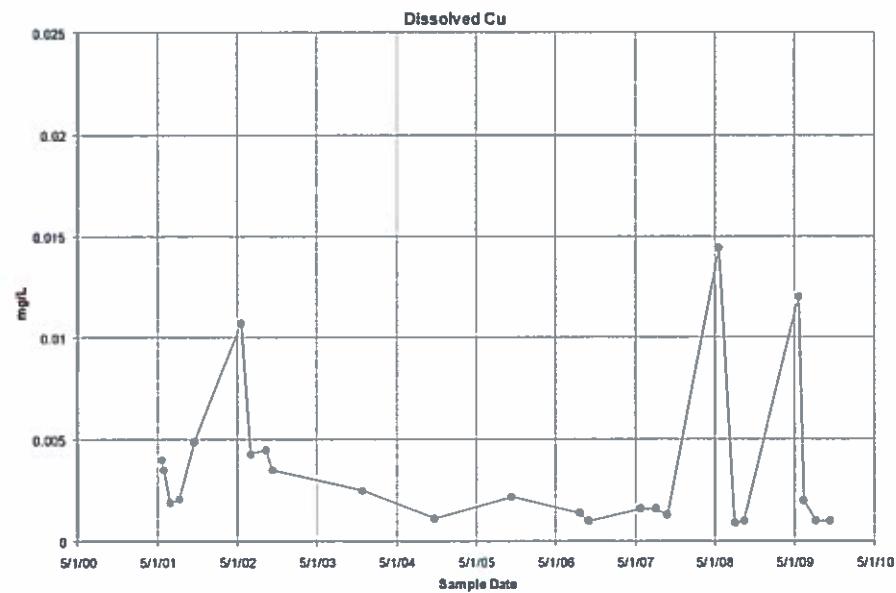
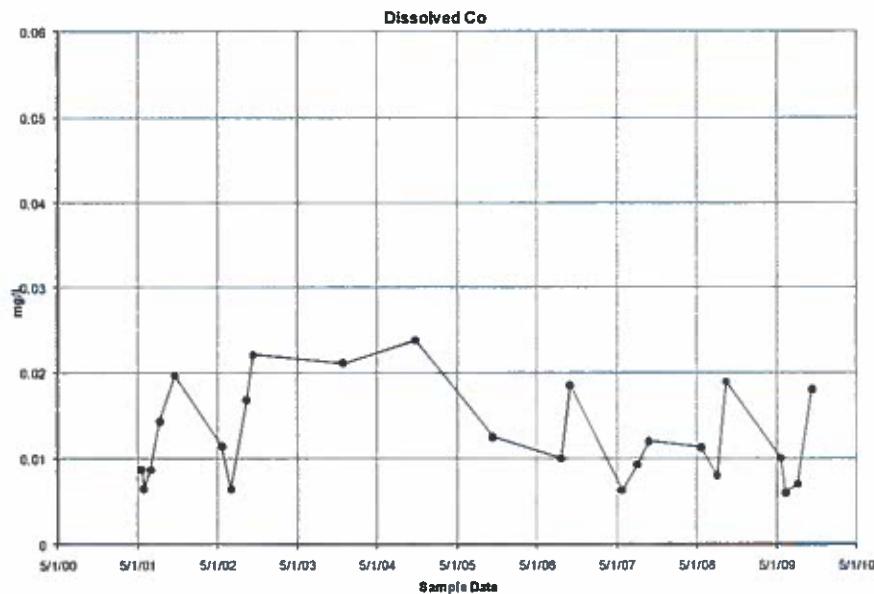




**FIGURE 3-11a**  
**2000 - 2009 DATA FOR SAMPLING LOCATION WQ-24 and WQ-24a**



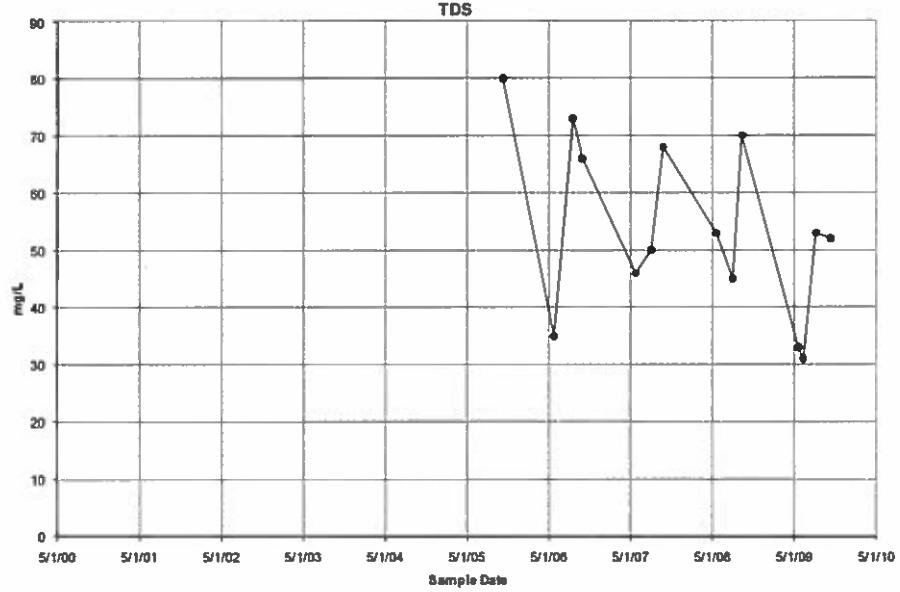
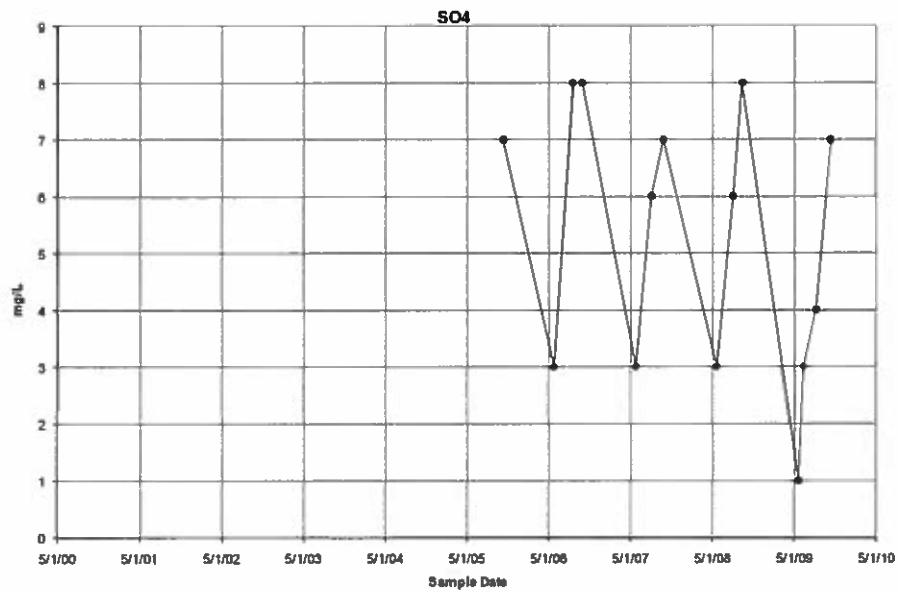
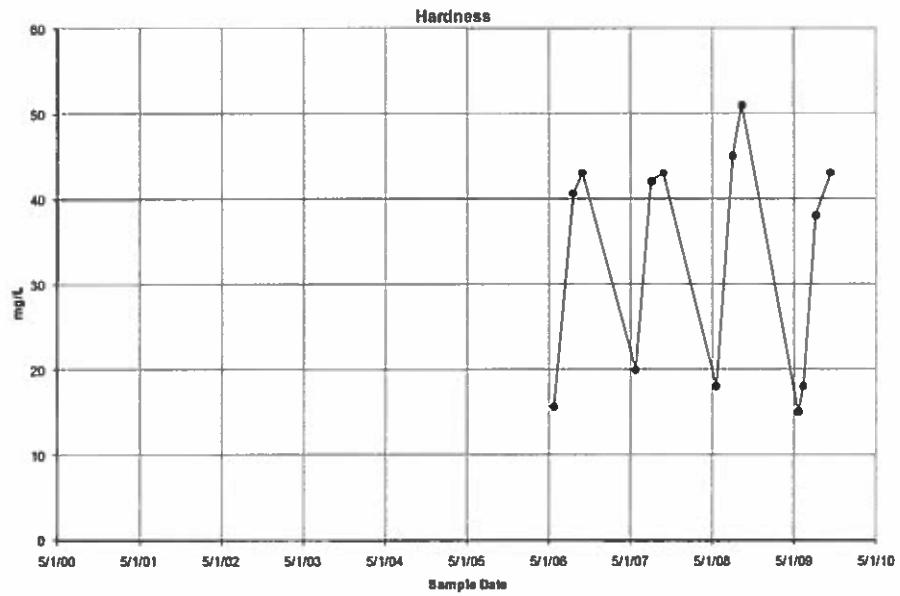
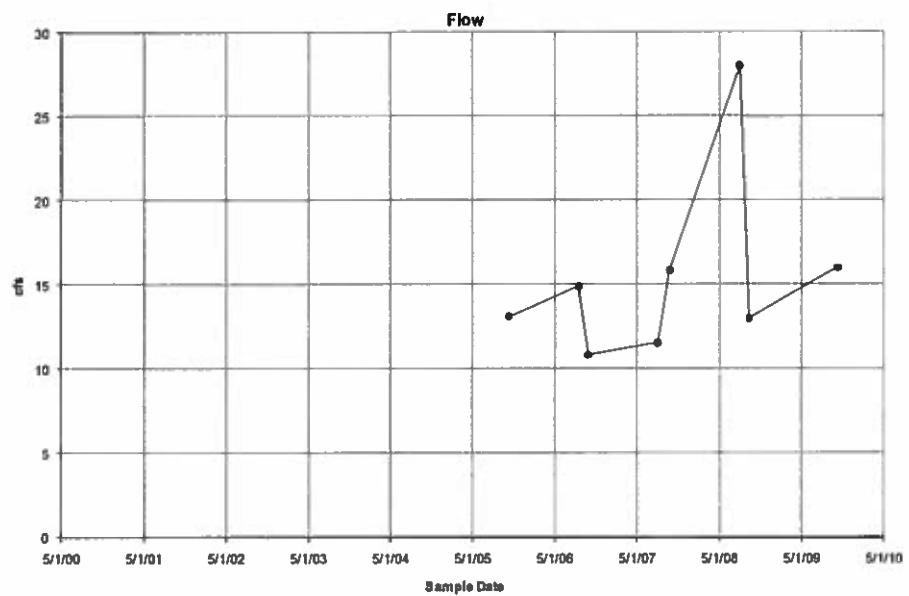




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**FIGURE 3-12b**  
**2000 - 2009 DATA FOR SAMPLING LOCATION WQ-25**

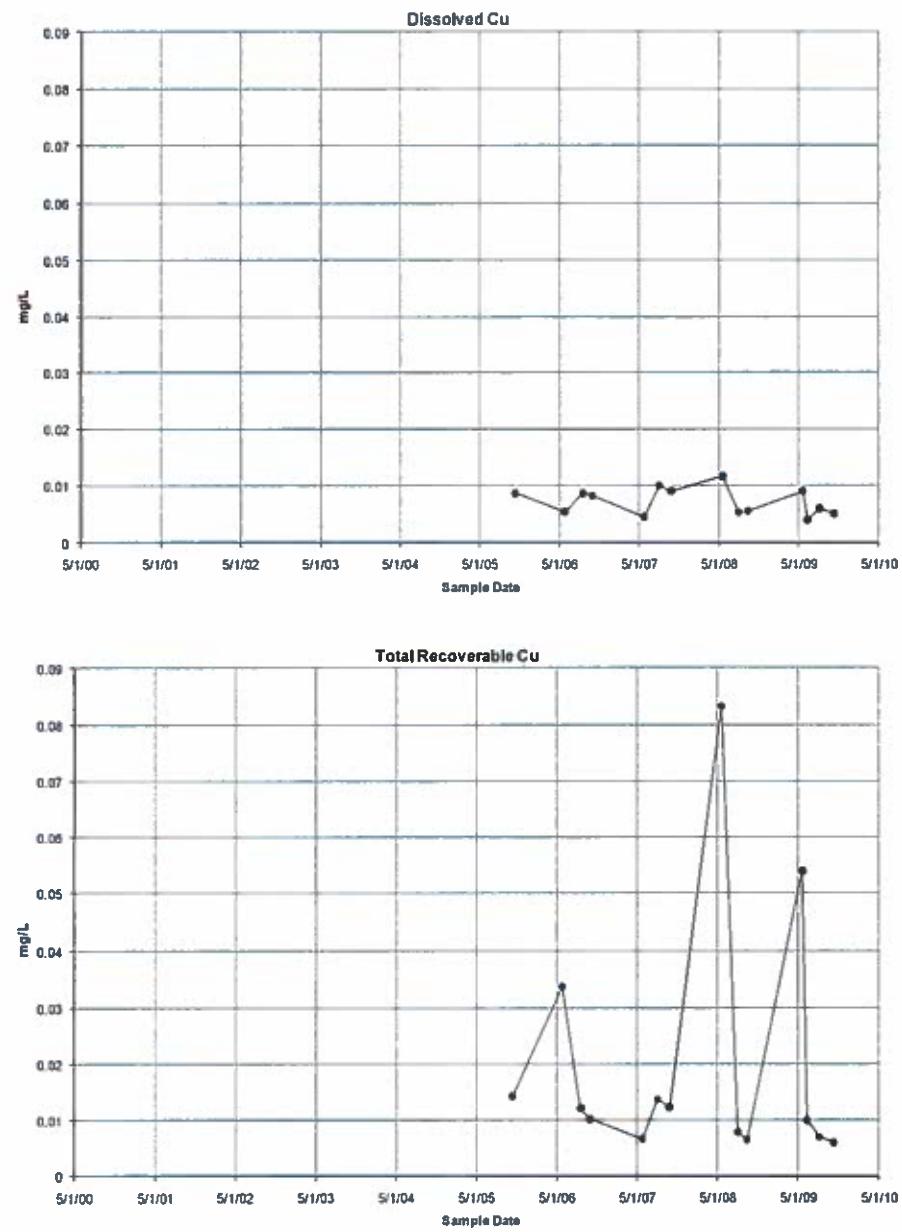
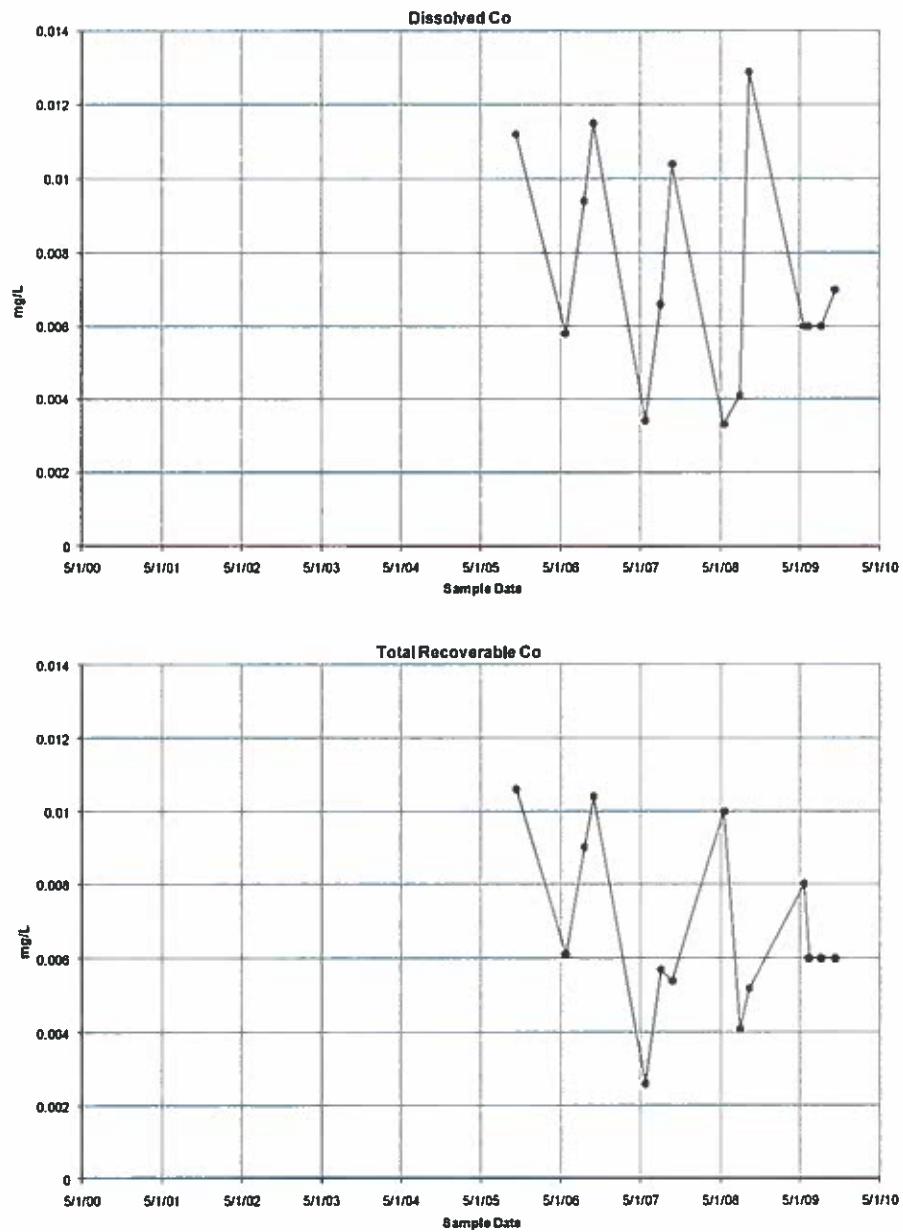
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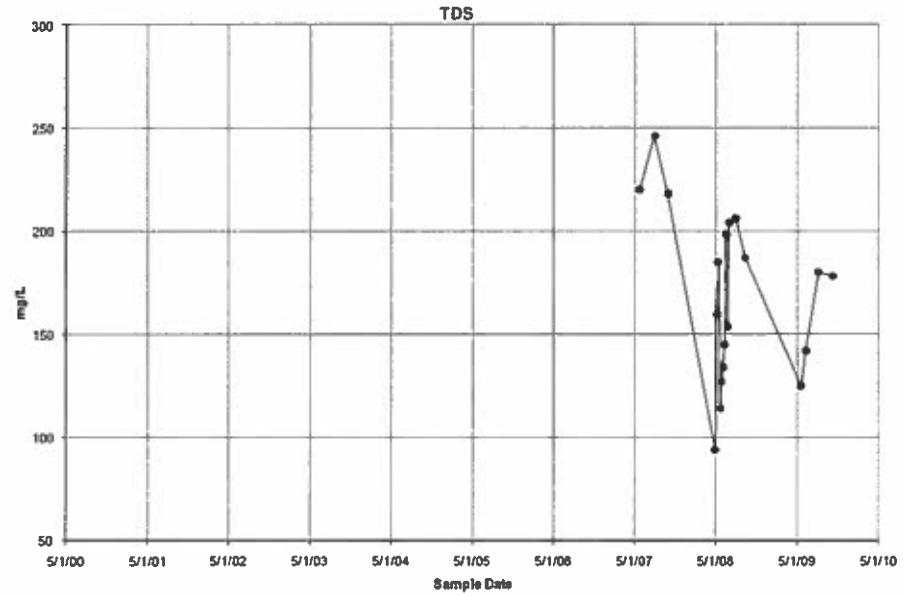
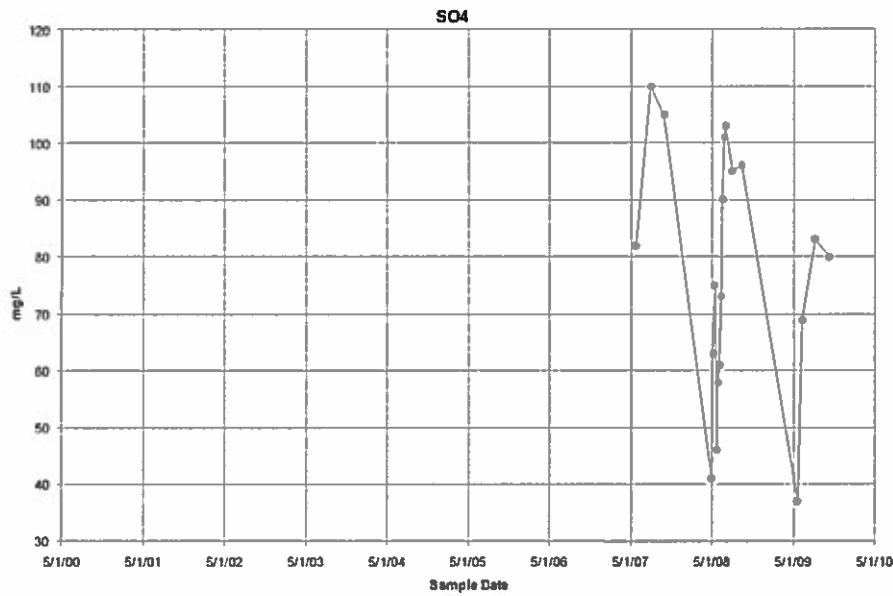
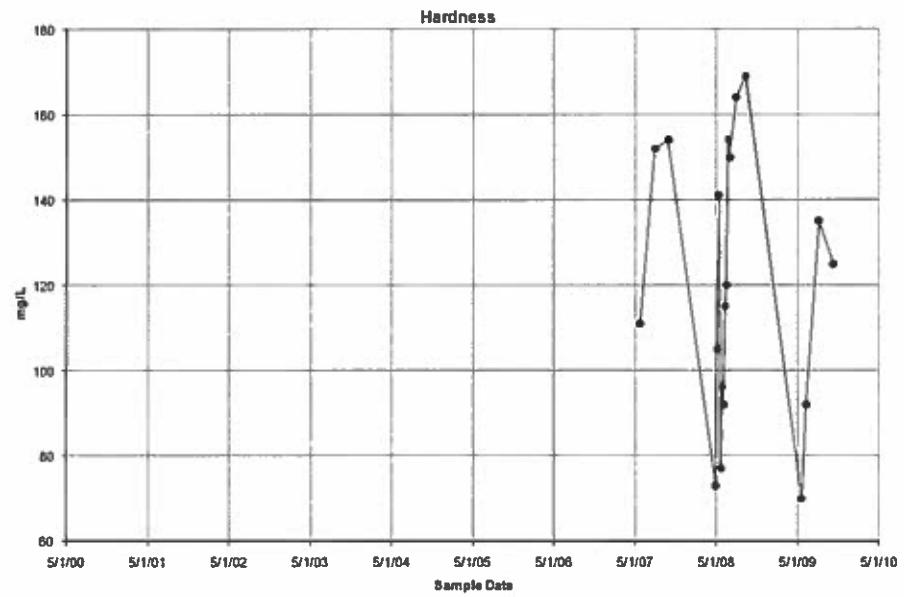
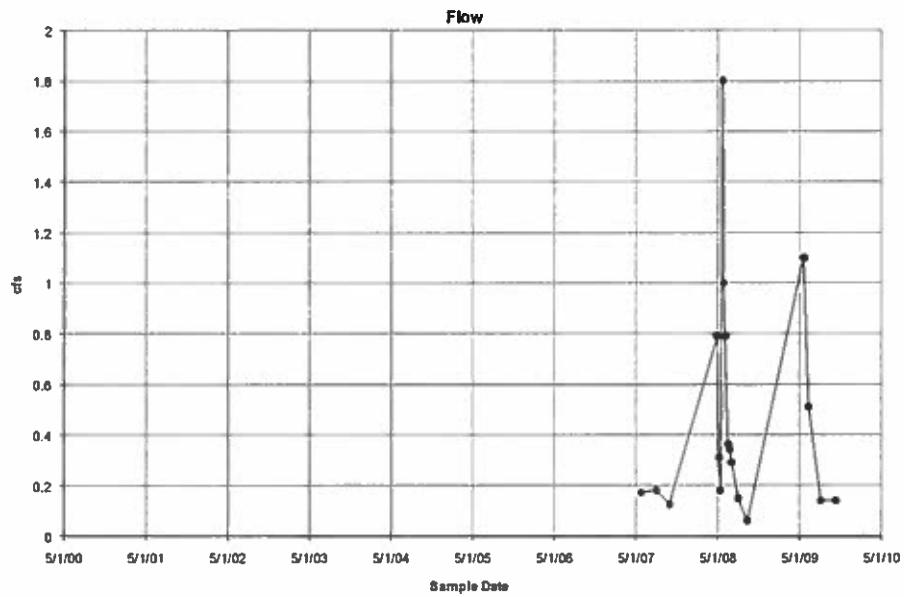


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**FIGURE 3-13a**  
**2000 - 2009 DATA FOR SAMPLING LOCATION WQ-28**

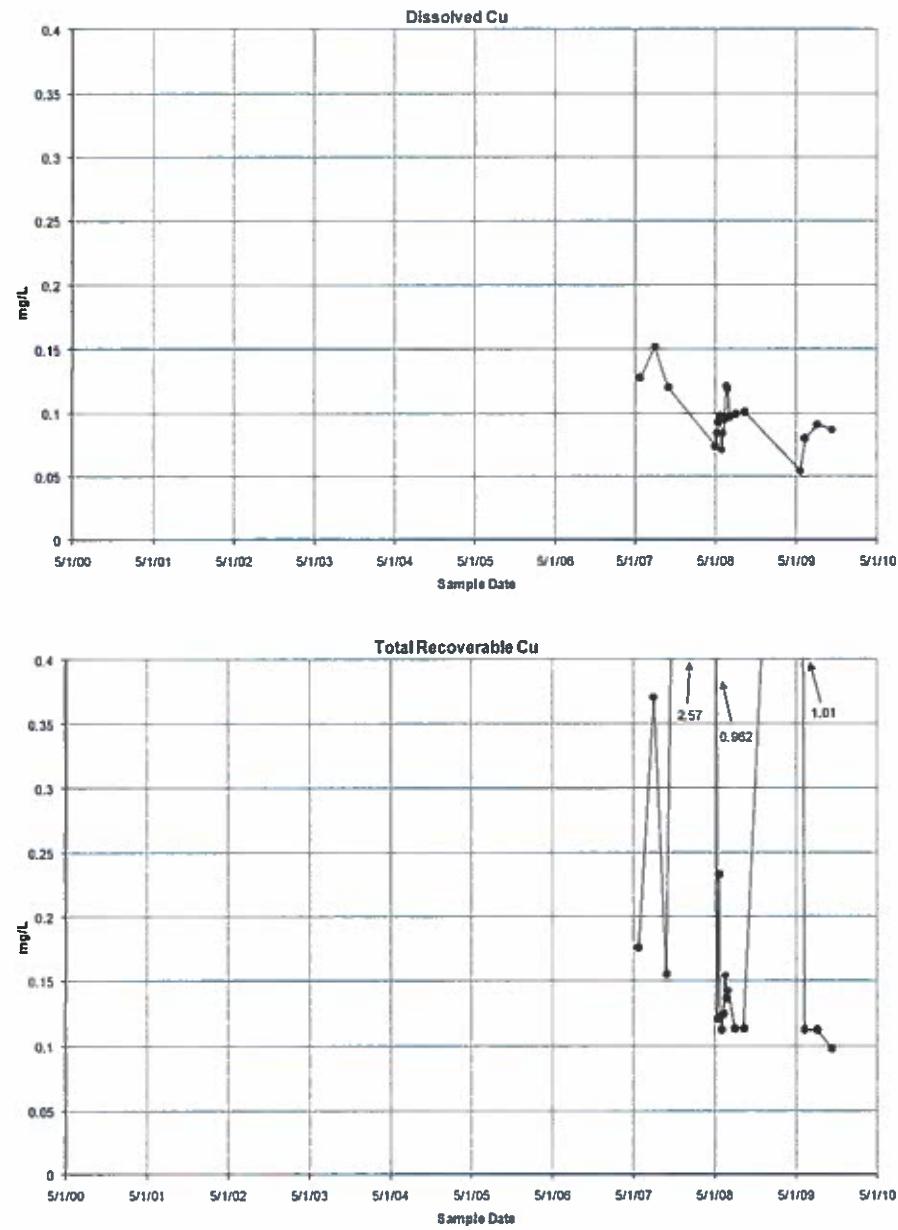
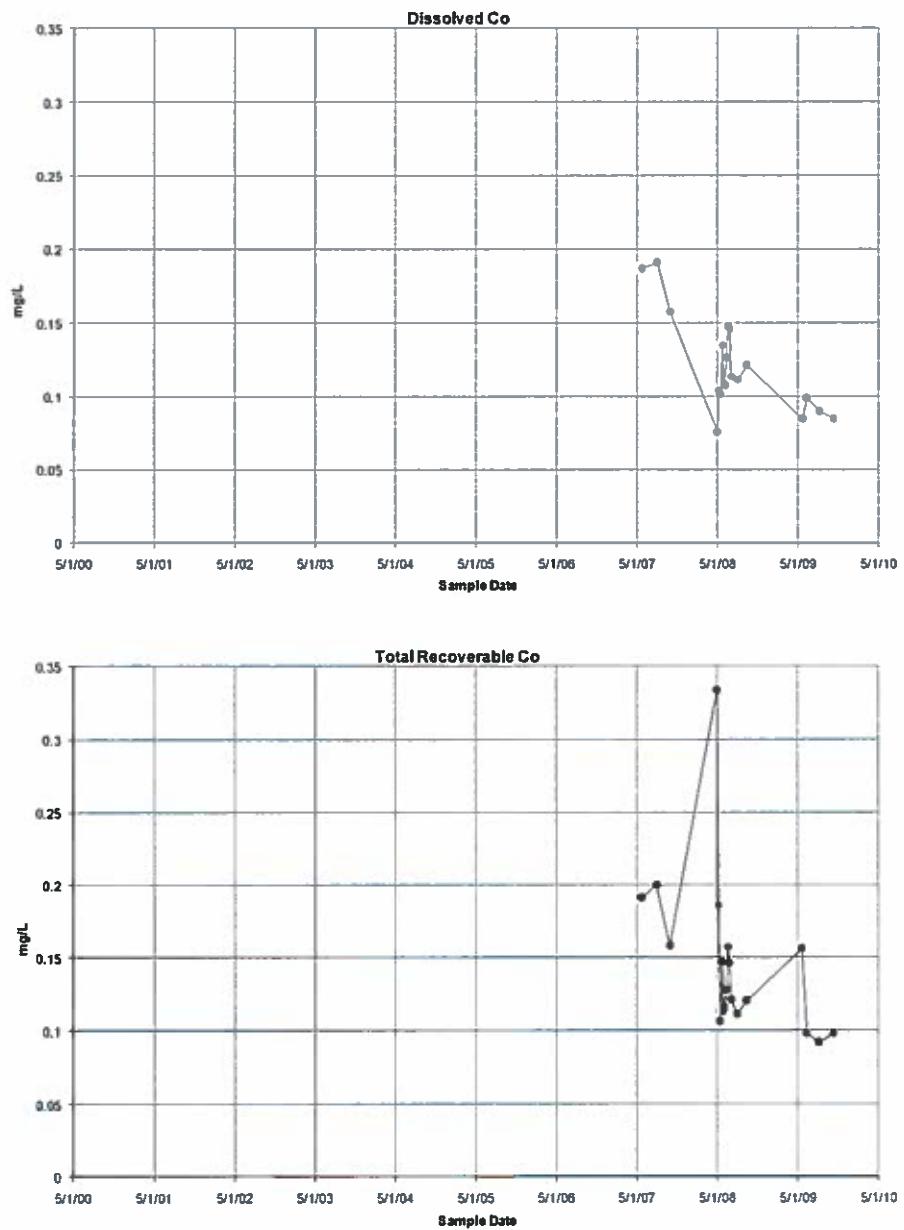


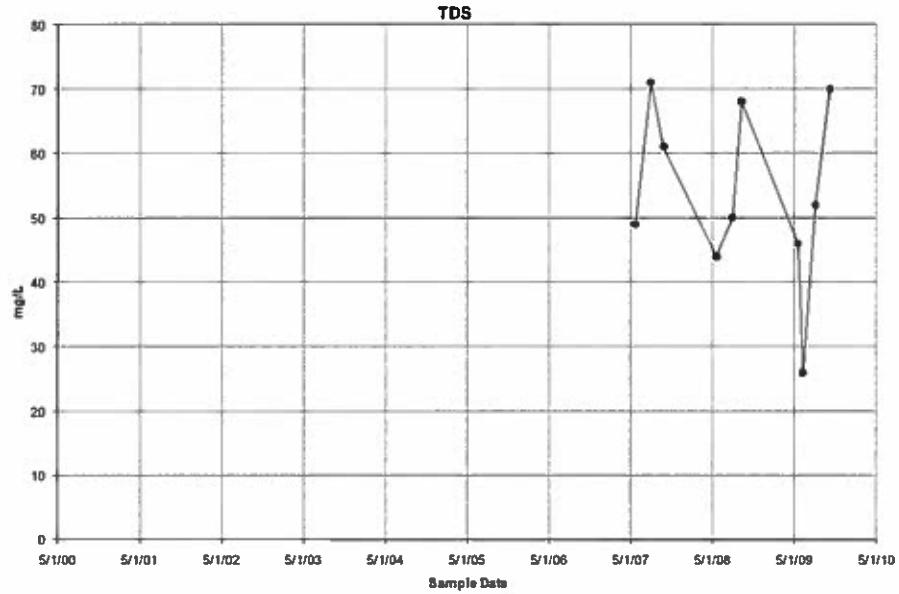
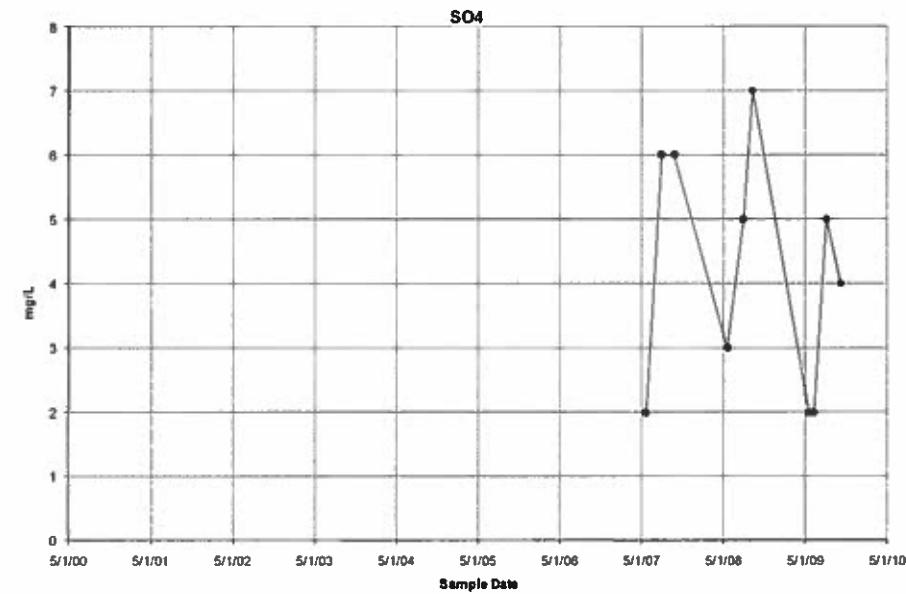
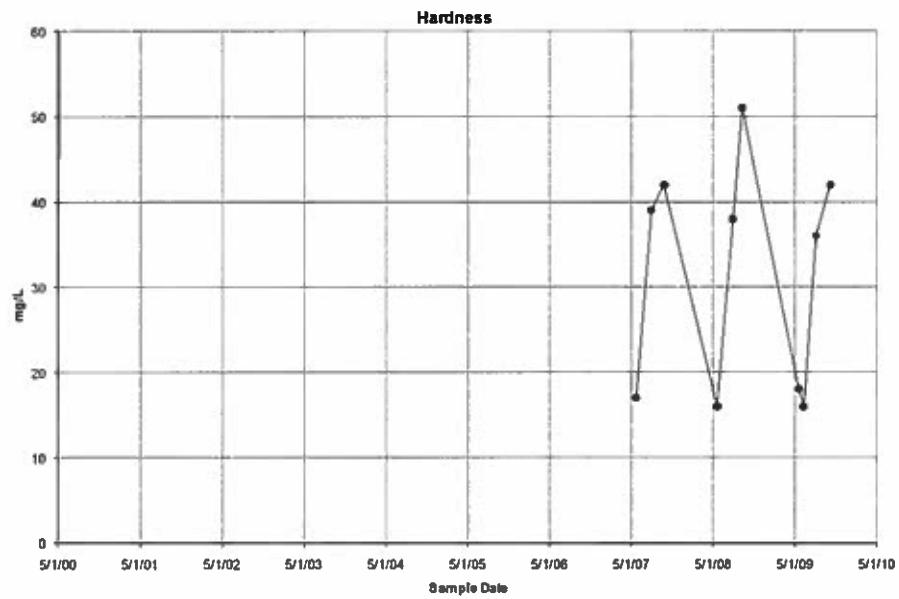
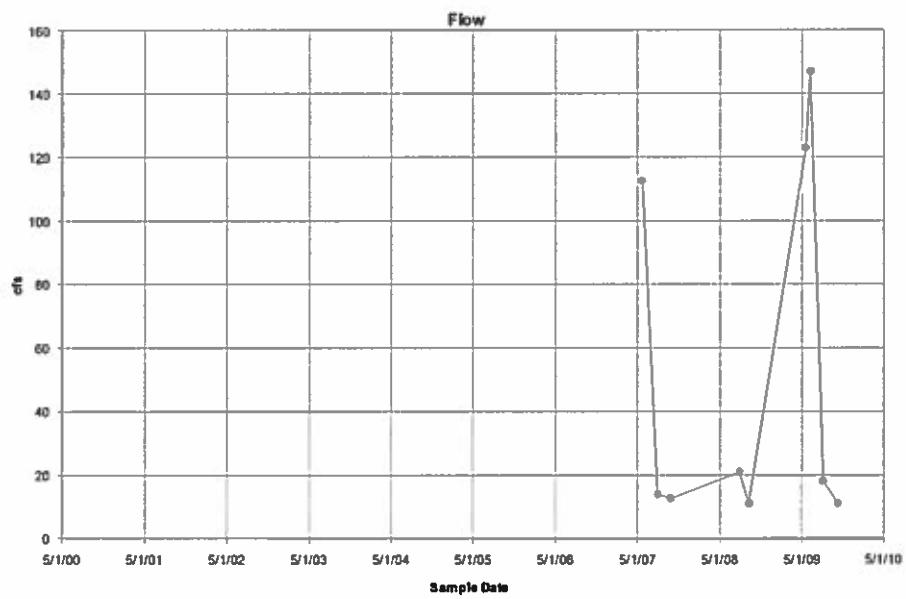


The logo consists of the word "TELESTO" in a large, bold, sans-serif font. A registered trademark symbol (®) is positioned at the end of the "O". Below "TELESTO", the word "SOLUTIONS" is written in a smaller, all-caps, sans-serif font. To the right of "SOLUTIONS", there is some very small, illegible text.

**FIGURE 3-14a  
2000 - 2009 DATA FOR SAMPLING LOCATION WQ-29**

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The logo consists of a diamond shape filled with horizontal and vertical lines forming a grid pattern.  
**Formation**

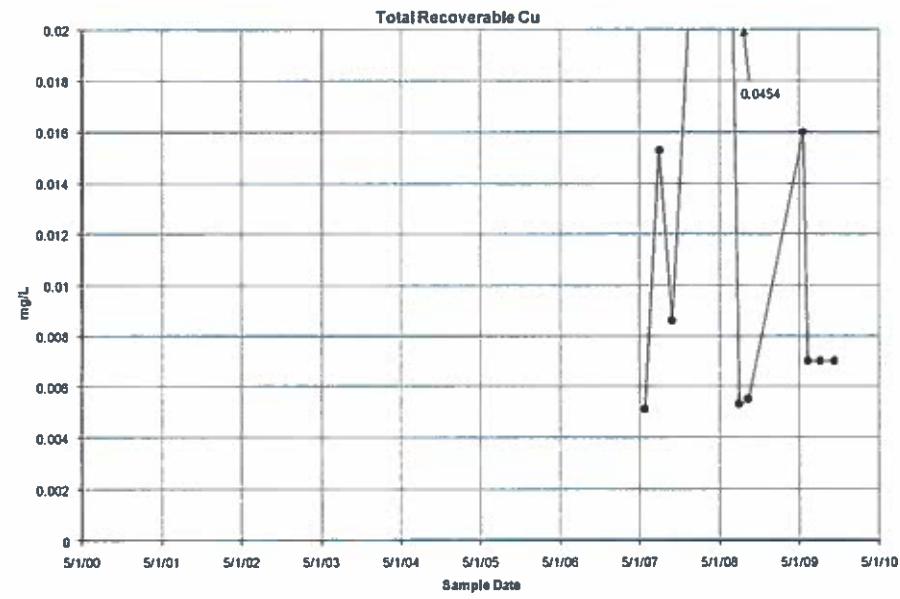
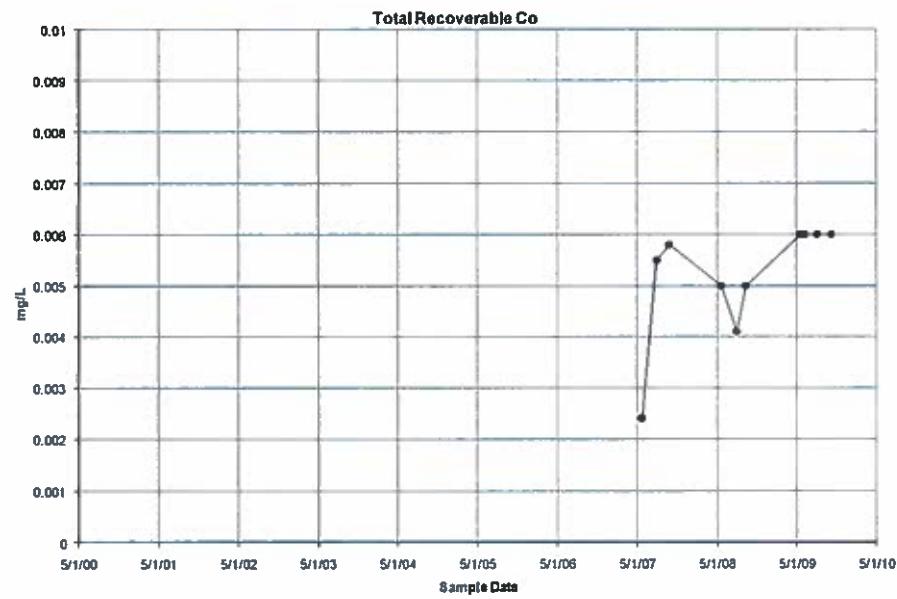
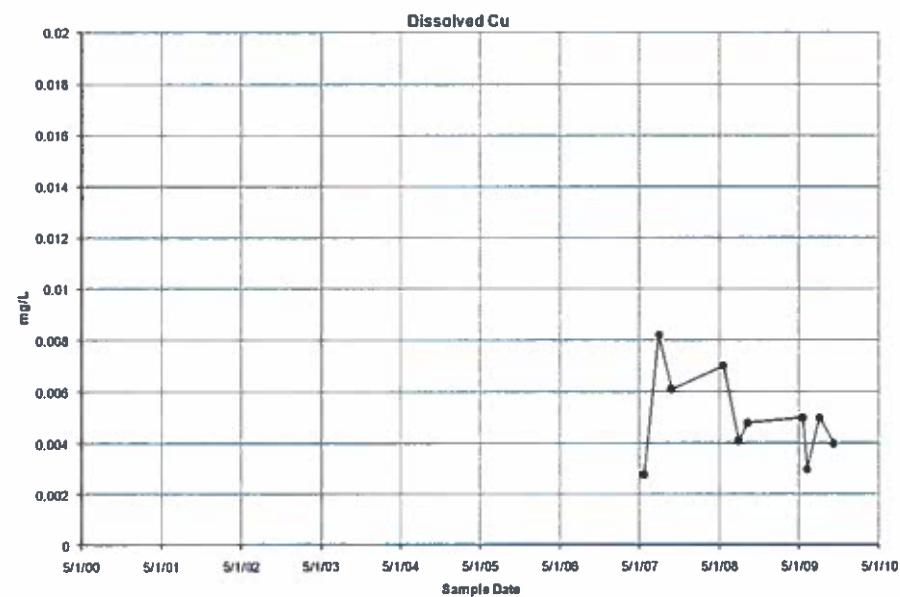
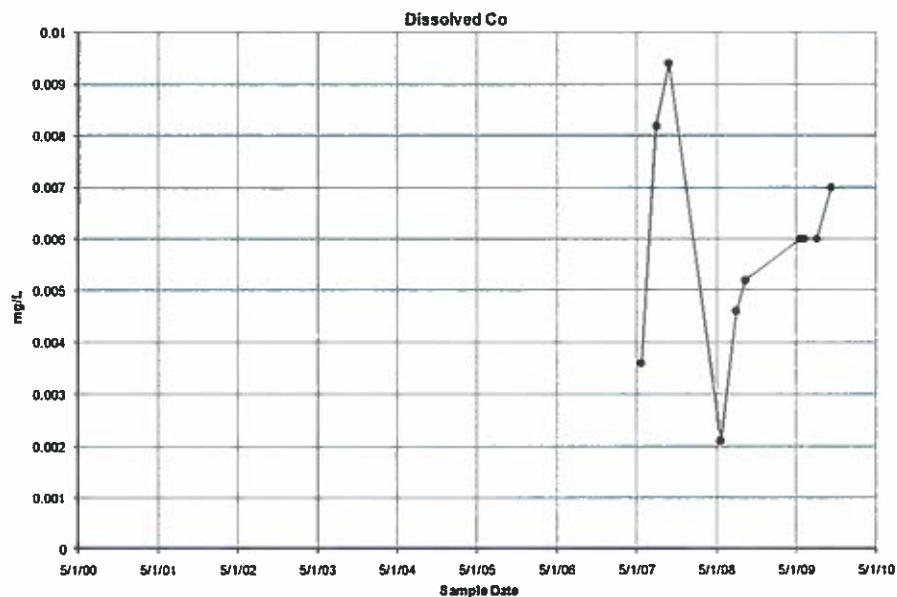


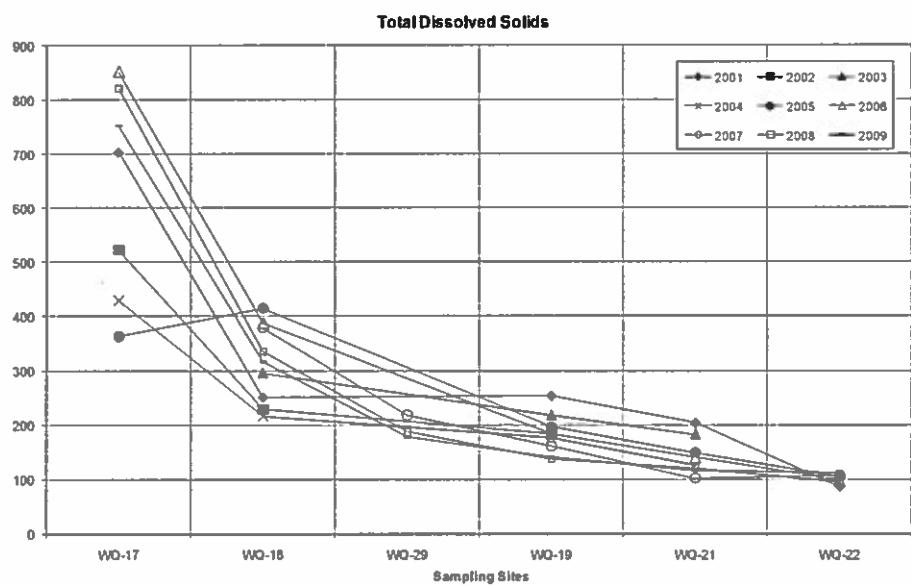
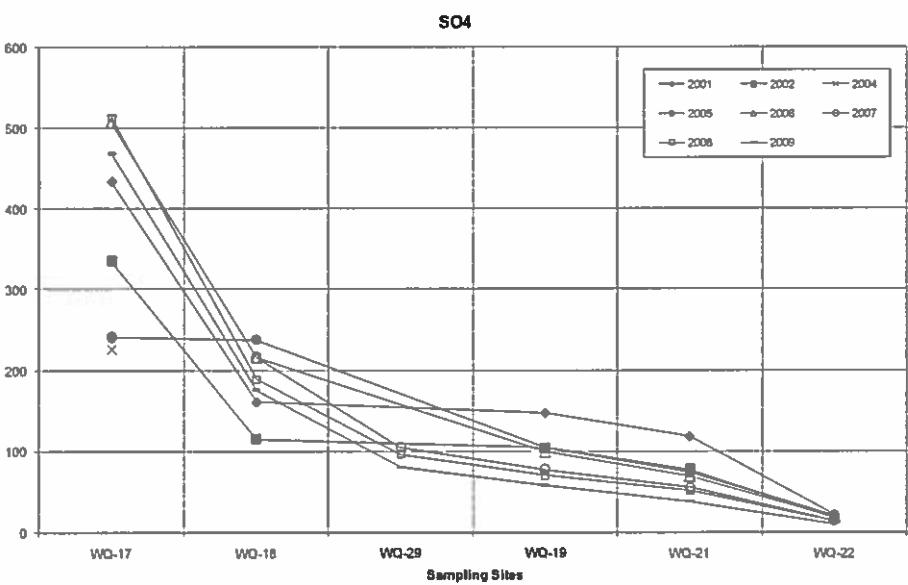
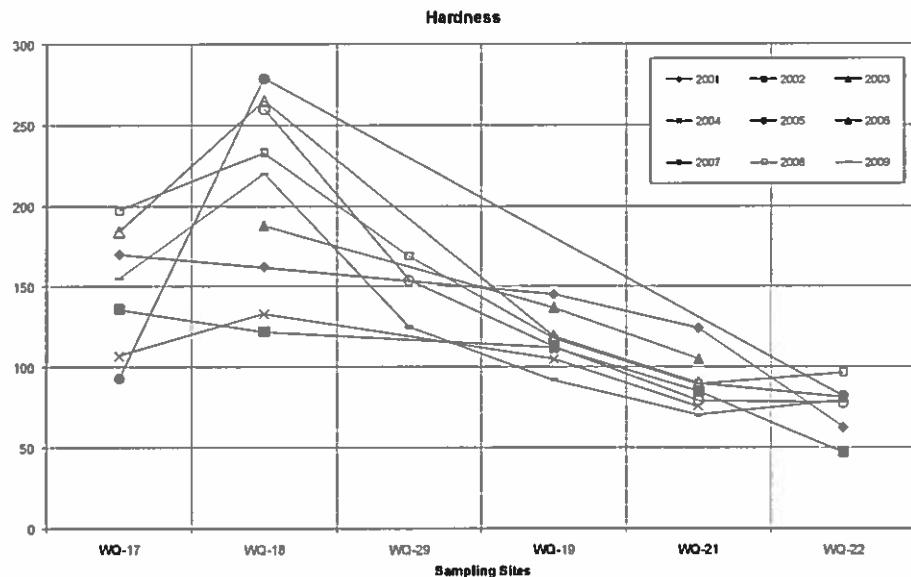
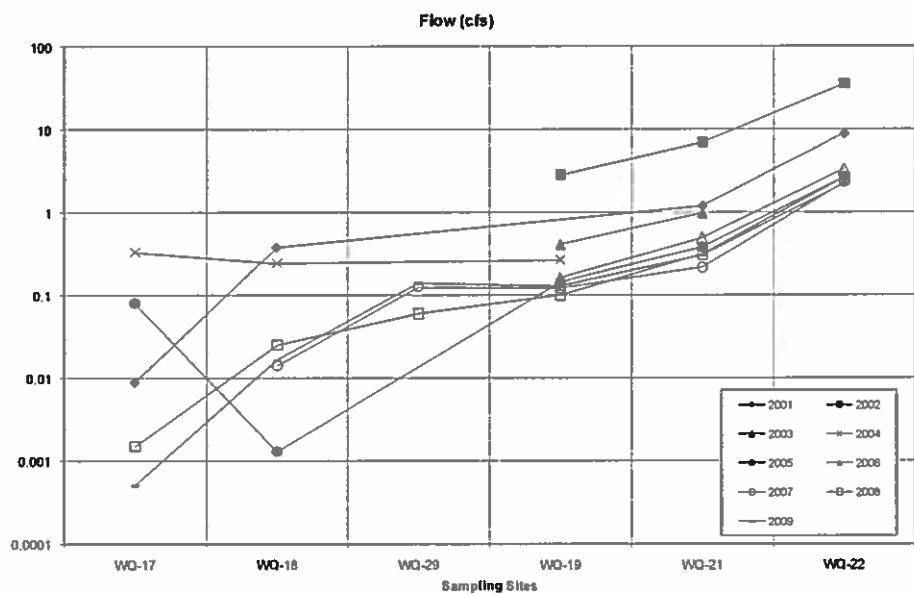


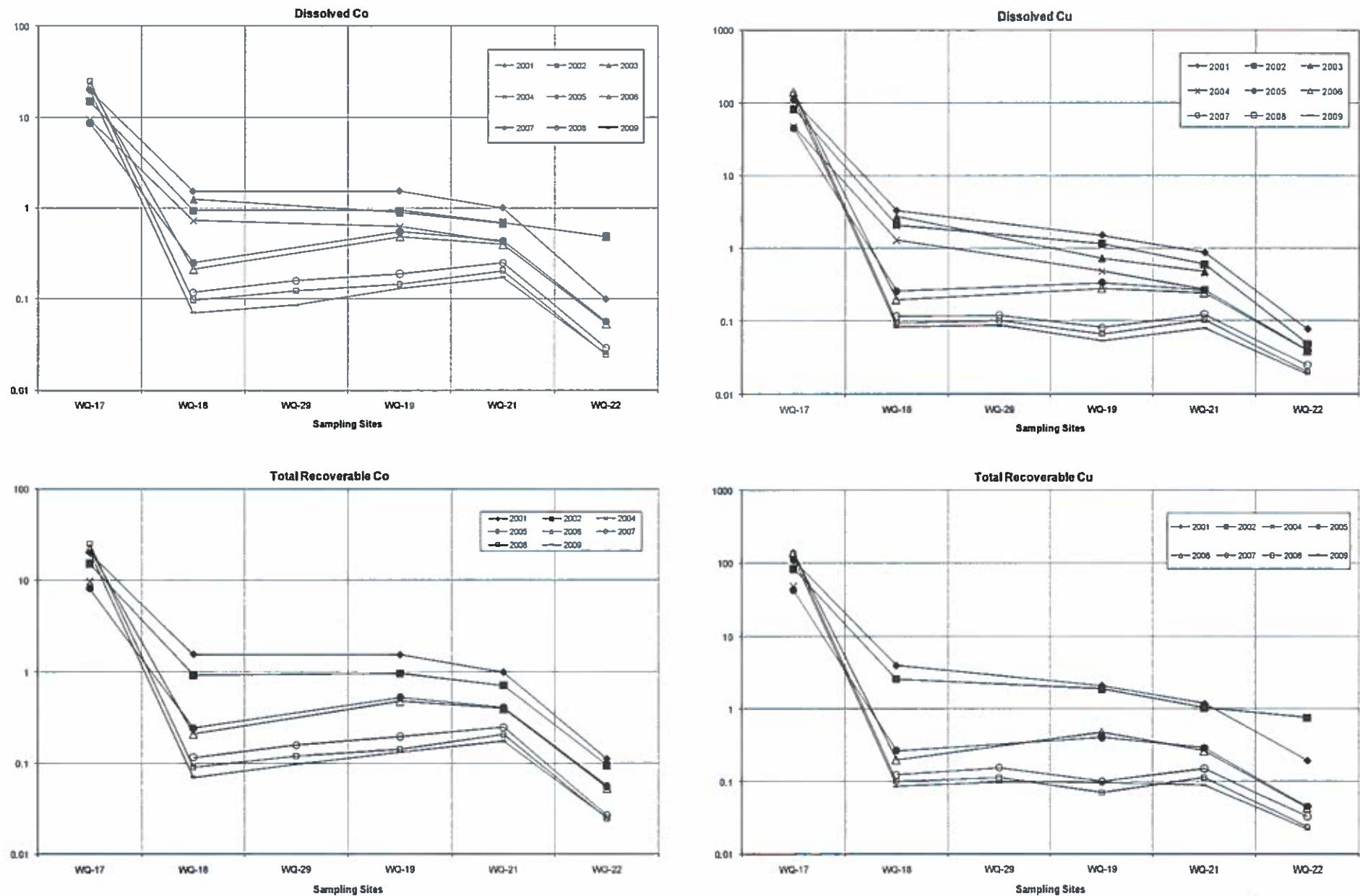
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**FIGURE 3-15a**  
**2000 - 2009 DATA FOR SAMPLING LOCATION WQ-30**

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**FIGURE 3-16b**  
2000 - 2009 Bucktail Creek/South Fork Big Deer Creek Downstream Water Quality

## Appendix A

**APPENDIX A**  
**2009 WATER QUALITY/QUANTITY SUMMARY**

Analyte	BFMW-1			BFMW-3			BFMW-4d			RMW-2			RMW-3			RMW-6		
	6/3/2009	8/11/2009	10/5/2009	6/3/2009	8/11/2009	10/5/2009	6/3/2009	8/11/2009	10/5/2009	6/1/2009	8/10/2009	10/6/2009	6/1/2009	8/10/2009	10/6/2009	6/1/2009	8/10/2009	10/6/2009
Air Temperature (Field-Degrees Celsius)	20.23	22.71	3.88	15.72		0.44	10.79	28.49	4.11	19.45	17.43	1.16	11.63	25.6	11.42	21.85	20.57	4.08
Ammonia-N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	1	0.9	0.9	0.8	0.8	0.7	0.9	0.9	0.9	2.3	2.3	2.3	2.7	2.7	2.6	1.7	1.6	1.6
Conductivity (mS/cm)	0.027	0.032	0.027	0.028	0.033	0.03	0.036	0.041	0.038	0.268	0.263	0.261	0.09	0.088	0.089	0.084	0.082	0.085
Conductivity (Field-mS/cm)	0.02	0.024	0.025	0.021	0.027	0.028	0.028	0.035	0.036	0.225	0.256	0.254	0.076	0.087	0.086	0.074	0.083	0.083
Depth To Water (Field-feet)	13.01	22.27	43.06	30.29	31.51	32.12	22.39	32.96	43.06	86.9	87.43	87.54	194.26	195.02	195.34	166.65	166.4	166.27
Dissolved Aluminum	<0.08	<0.08	0.21	<0.08	0.08	<0.08	0.11	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Dissolved Antimony	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dissolved Arsenic	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.06	0.05
Dissolved Barium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Calcium	1.49	1.49	1.5	1.55	1.69	1.77	2.19	2.35	2.32	26.6	27.2	26.4	3.52	3.72	3.61	3.54	3.8	3.92
Dissolved Cobalt	<0.006	<0.006	<0.006	0.032	0.035	0.036	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.166	0.168	0.166	0.237	0.239	0.246
Dissolved Copper	0.049	0.043	0.049	0.009	0.007	0.006	0.013	0.018	0.005	0.003	0.003	0.003	0.089	0.079	0.082	0.035	0.038	0.034
Dissolved Iron	0.08	0.08	0.19	0.08	0.09	0.06	0.1	0.09	0.08	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	1.18	1.24	1.22
Dissolved Lead	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Magnesium	0.7	0.8	0.8	0.9	1	1.1	1.2	1.3	1.3	12.6	12.8	13.2	2.7	2.8	2.6	2.6	2.8	3
Dissolved Manganese	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.023	0.019	0.02	0.06	0.063	0.061	<0.005	<0.005	<0.005	0.063	0.063	0.067
Dissolved Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Dissolved Nickel	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.003	0.003	0.001	0.001	0.001
Dissolved Oxygen (Field)	9.39	10.14	7.98	9.17	11.12	4.22	2.76	1.78	4.97	0.78	0.65	0.57	7.52	8.58	7.93	6.12	7.39	5.37
Dissolved Potassium	<1	1	1	1	2	2	<1	1	1	5	6	6	6	6	6	4	5	5
Dissolved Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.001	<0.001	<0.001	<0.001
Dissolved Silver	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Sodium	2	1	1	1	1	1	2	2	2	3	3	3	4	3	4	3	2	2
Dissolved Thallium	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dissolved Zinc	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.027	0.02	0.018
Flow (Field)																		
Fluoride	0.06	<0.05	0.07	0.06	<0.05	0.05	0.06	<0.05	0.07	0.29	0.32	0.3	0.37	0.5	0.37	0.27	0.27	0.27
Gage Height (Field)																		
Hardness	7	7	7	8	8	9	11	11	11	118	121	120	20	21	20	20	21	22
Nitrate + Nitrite as N	0.12	0.12	0.12	0.12	0.14	0.13	0.15	0.17	0.15	<0.05	<0.05	<0.05	0.29	0.3	0.28	0.07	0.1	<0.05
Oxidation Reduction Potential (Field)										236.1			394.2			302.4		
pH (Field-Standard Units)	4.69	5.19	4.67	5.29	4.36	5.27	5.14	5.14	5.17	7.17	6.77	7.02	5.2	5.21	5.47	5.14	5.96	5.37
pH (Standard Units)	5.95	5.72	5.84	6.29	6.06	6.16	5.9	5.71	5.73</									

Analyte	RMW-7				WQ-3				WQ-10				WQ-16				WQ-17				WQ-18			
	6/3/2009	8/11/2009	10/6/2009	5/20/2009	6/10/2009	8/5/2009	10/9/2009	5/19/2009	6/9/2009	8/4/2009	10/8/2009	5/19/2009	6/9/2009	8/4/2009	10/8/2009	5/19/2009	6/9/2009	8/4/2009	10/8/2009	5/19/2009	6/9/2009	8/4/2009	10/8/2009	
Air Temperature (Field-Degrees Celsius)	15.32	22.53	17.52	18.78	13.63		5.61	17.72	15.75	21.58	6.59	16.51	11.91				10.9	24.83	3.48	11.22	16.77	23.73	8.66	
Ammonia-N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05			0.09	0.05	0.11	0.11	<0.05	<0.05	<0.05	<0.05	
Chloride	4.2	4.4	4.1	0.7	0.5	0.9	1.3	1.8	1.9	2.2	2.4	<0.5	0.6			2.6	3.7	5.7	5.8	0.8	1.1	1.7	1.7	
Conductivity (mS/cm)	0.115	0.125	0.123	0.048	0.048	0.089	0.103	0.082	0.095	0.111	0.107	0.066	0.191			0.495	0.556	0.849	0.87	0.161	0.245	0.483	0.493	
Conductivity (Field-mS/cm)	0.092	0.118	0.118	0.039	0.042	0.088	0.099	0.068	0.082	0.106	0.105	0.056	0.138			0.423	0.536	0.842	0.851	0.135	0.215	0.464	0.478	
Depth To Water (Field-feet)	240.17	244.14	245.36																					
Dissolved Aluminum	<0.08	<0.08	<0.08	0.36	0.24	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.13	<0.08			4.66	4.79	8.25	8.26	<0.08	<0.08	<0.08	<0.08	
Dissolved Antimony	<0.0005	<0.0005	<0.0005																					
Dissolved Arsenic	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0.03	0.02	0.02	0.02	<0.01	<0.01			<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Dissolved Barium	<0.01	<0.01	<0.01																					
Dissolved Beryllium	<0.001	<0.001	<0.001																					
Dissolved Cadmium	<0.0001	<0.0001	<0.0001	0.0017	<0.0001	<0.0001	<0.0001	0.0007	0.0015	<0.0001	<0.0001	0.0017			0.0003	0.0013	0.0007	0.0008	<0.0001	0.0008	<0.0001	<0.0001	<0.0001	
Dissolved Calcium	5.06	5.54	3.88	4.78	5.14	9.52	11.3	4.35	5.39	6.75	6.1	5.19	21.4			12.4	18.2	28	27	16.1	28.3	68.1	69.2	
Dissolved Cobalt	0.072	0.077	0.076	0.009	<0.006	0.008	0.016	0.1	0.131	0.149	0.145	0.132	0.106			9.12	11.9	19.4	19.7	0.097	0.1	0.089	0.07	
Dissolved Copper	0.034	0.034	0.037	0.011	0.001	0.001	<0.001	0.024	0.014	0.013	0.012	0.303	0.053			55.8	53.4	107	114	0.044	0.095	0.119	0.083	
Dissolved Iron	<0.03	<0.03	<0.03	0.33	0.1	0.05	0.05	0.1	<0.03	<0.03	0.2	<0.03			0.24	0.05	0.04	0.13	<0.03	<0.03	<0.03	<0.03		
Dissolved Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Dissolved Magnesium	3.8	4.4	2.9	1.1	1	2	2.4	2.4	3.4	3.8	3.5	1.6	5			10.4	14.5	21.5	21.3	5.3	6.7	11.6	11.5	
Dissolved Manganese	<0.005	<0.005	<0.005	0.018	0.007	0.006	0.007	<0.005	<0.005	<0.005	<0.005	0.096	0.008			1.06	1.29	2.37	2.5	0.035	0.006	<0.005	<0.005	
Dissolved Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		
Dissolved Nickel	0.001	0.002	0.002	0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.003	0.003			0.173	0.207	0.341	0.354	0.002	0.002	0.002	0.002	
Dissolved Oxygen (Field)	9.31	11.7	9.07	11.03	11.7	8.51	12.93	10.03	10.21	10.17	9.88	10.18	10.06			10.37	10.97	10.91	10.57	9.04	10.06	10.34	10.72	
Dissolved Potassium	6	7	6	2	1	2	2	5	5	5	5	3	3			14	17	27	29	4	3	4	4	
Dissolved Selenium	0.001	<0.001	0.001	<0.001	0.003	<0.001	<0.001	<0.001	0.001	0.004	0.002	<0.001	0.004			0.002	0.004	0.004	0.004	<0.001	0.003	0.001	0.001	
Dissolved Silver	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Dissolved Sodium	5	6	3	3	2	4	4	3	4	4	3	<1	1			1	1	1	2	2	4	4		
Dissolved Thallium	<0.0005	<0.0005	<0.0005																					
Dissolved Zinc	0.007	0.01	0.013	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005			0.15	0.181	0.278	0.293	<0.005	<0.005	<0.005	<0.005	
Flow (Field)				TH	TH	NM	56	0.29	0.16	0.03	0.025	TH	TH	TL	TL	TH	TH	TL	0.0005	1.1	0.3	0.034	0.0164	
Fluoride	0.29	0.31	0.29	0.15	0.08	0.15	0.15	0.21	0.22	0.24	0.23	0.05	0.05			0.34	0.44	0.64	0.61	0.12	0.11	0.15	0.13	
Gage Height (Field)								1.25	0.18	1.15	1.17												<	
Hardness	29	32	22	17	17	32	38	21	28	32	30													

Analyte	WQ-19				WQ-20				WQ-21				WQ-22				WQ-23				WQ-24n				
	5/19/2009	6/9/2009	8/4/2009	10/8/2009	5/18/2009	6/8/2009	8/3/2009	10/7/2009	5/18/2009	6/8/2009	8/3/2009	10/7/2009	5/18/2009	6/8/2009	8/3/2009	10/7/2009	5/18/2009	6/8/2009	8/3/2009	10/7/2009	5/18/2009	6/8/2009	8/3/2009	10/7/2009	
Air Temperature (Field- Degrees Celsius)		14.8	14.9	4.95	11.63	12.53	25.5	8.66	14.41	12.75	21.23	5.32	35.05	8.49		4.95	12.34	8.45	20.39	9.76	22.89	6.91	24.84	10.44	
Ammonia-N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Chloride	1.6	1.4	2	2.1	0.5	0.5	0.8	1	1.4	1.5	2	2.1	0.7	0.6	1	1.2	<0.5	<0.5	0.6	0.7	<0.5	<0.5	0.7	0.8	
Conductivity (mS/cm)	0.16	0.193	0.242	0.237	0.101	0.103	0.163	0.174	0.106	0.148	0.181	0.181	0.106	0.107	0.165	0.173	0.04	0.03	0.069	0.079	0.049	0.042	0.092	0.102	
Conductivity (Field-mS/cm)	0.134	0.165	0.235	0.228	0.084	0.085	0.157	0.166	0.09	0.128	0.175	0.173	0.09	0.089	0.16	0.168	0.033	0.027	0.061	0.051	0.041	0.03	0.09	0.095	
Depth To Water (Field-feet)																									
Dissolved Aluminum	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.11	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.18	<0.08	<0.08	<0.08	0.17	<0.08	<0.08	<0.08	
Dissolved Antimony																									
Dissolved Arsenic	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Dissolved Barium																									
Dissolved Beryllium																									
Dissolved Cadmium	<0.0001	0.0007	0.0009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0007	<0.0001	<0.0001	<0.0001	0.0008	<0.0001	<0.0001	<0.0001	0.0017	<0.0001	<0.0001	<0.0001	0.0019	<0.0001	<0.0001	
Dissolved Calcium	16	21.1	29.5	27.4	15.5	16.9	25.5	29.2	9.78	16	18.8	19.4	15.4	17.1	25.1	27.3	4.35	3.48	8.3	9.84	5.91	5.49	12.4	14.1	
Dissolved Cobalt	0.106	0.114	0.114	0.13	<0.06	<0.06	<0.06	<0.06	0.092	0.13	0.152	0.172	0.012	0.011	0.021	0.025	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	
Dissolved Copper	0.062	0.056	0.055	0.054	<0.001	<0.001	<0.001	<0.001	0.1	0.069	0.084	0.079	0.019	0.009	0.02	0.019	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	0.004	0.004	
Dissolved Iron	0.08	0.04	<0.03	<0.03	0.08	<0.03	<0.03	<0.03	0.11	0.04	<0.03	0.04	0.05	<0.03	<0.03	<0.03	0.08	0.04	<0.03	0.09	0.03	<0.03			
Dissolved Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Dissolved Magnesium	4.6	5.4	5.8	5.7	1.2	1	1.6	2.1	3.1	4.4	4.8	5.1	1.5	1.4	2.1	2.6	0.6	0.4	1	1.3	0.8	0.6	1.3	1.6	
Dissolved Manganese	0.015	0.007	0.006	0.005	0.009	<0.005	<0.005	<0.005	0.008	0.006	0.009	0.007	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	
Dissolved Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		
Dissolved Nickel	0.002	0.002	0.002	0.002	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.003	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Dissolved Oxygen (Field)	9.52	10.83	10.32	12.6	9.77	10.78	10.19	11.78	9.46	10.15	9.79	11.76	9.71	10.62	10.9	12.09	9.94	10.91	9.23	11.65	10.27	11.47	9.56	11.89	
Dissolved Potassium	4	3	4	4	1	1	1	2	3	4	4	4	2	1	2	2	<1	<1	<1	<1	<1	<1	<1	<1	
Dissolved Selenium	<0.001	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001		
Dissolved Silver	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Dissolved Sodium	3	3	4	4	2	2	3	3	3	3	3	3	2	2	3	3	2	2	3	4	2	2	3	4	
Dissolved Thallium																									
Dissolved Zinc	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Flow (Field)	1.3	0.56	N																						

Analyte	WQ-25				WQ-28				WQ-29				WQ-30			
	5/20/2009	6/10/2009	8/5/2009	10/9/2009	5/20/2009	6/10/2009	8/5/2009	10/9/2009	5/19/2009	6/9/2009	8/4/2009	10/8/2009	5/18/2009	6/8/2009	8/3/2009	10/7/2009
Air Temperature (Field- Degrees Celsius)	8.2	7.38		7.24	11.09	12.02		7.88	17.13	8.04	22.17	4.87	24.59	7.71	24.53	
Ammonia-N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	0.7	0.6	1	1.3	<0.5	<0.5	0.8	1	1.3	1.3	1.9	2	<0.5	<0.5	0.7	0.9
Conductivity (mS/cm)	0.048	0.048	0.09	0.11	0.04	0.047	0.099	0.108	0.178	0.225	0.311	0.303	0.05	0.042	0.095	0.103
Conductivity (Field-mS/cm)	0.039	0.047	0.087	0.079	0.032	0.042	0.096	0.104	0.15	0.186	0.302	0.291	0.041	0.03	0.09	0.099
Depth To Water (Field-feet)																
Dissolved Aluminum	0.26	0.13	<0.08	<0.08	0.14	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.16	<0.08	<0.08	<0.08
Dissolved Antimony																
Dissolved Arsenic	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Barium																
Dissolved Beryllium																
Dissolved Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0019	<0.0001	0.0018	<0.0001	<0.0001	<0.0001	0.0007	<0.0001	<0.0001
Dissolved Calcium	4.74	5.19	9.45	11.8	4.74	5.99	12.7	14.1	19.4	27	42.3	38.9	5.92	5.44	12.2	14
Dissolved Cobalt	0.01	<0.006	0.007	0.018	<0.006	<0.006	<0.006	0.007	0.085	0.099	0.09	0.085	<0.006	<0.006	<0.006	0.007
Dissolved Copper	0.012	0.002	0.001	<0.001	0.009	0.004	0.006	0.005	0.054	0.08	0.091	0.087	0.005	0.003	0.005	0.004
Dissolved Iron	0.26	0.12	0.05	0.06	0.1	0.04	<0.03	<0.03	0.1	<0.03	<0.03	<0.03	0.08	<0.03	<0.03	<0.03
Dissolved Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Magnesium	1.1	1	2	2.6	0.6	0.6	1.5	1.8	5.2	6.1	7.1	6.7	0.8	0.6	1.4	1.6
Dissolved Manganese	0.021	0.009	0.005	0.014	0.009	<0.005	<0.005	<0.005	0.022	0.007	<0.005	0.006	0.007	<0.005	<0.005	<0.005
Dissolved Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Dissolved Nickel	0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.002	0.002	<0.001	<0.001	<0.001	<0.001
Dissolved Oxygen (Field)	11.01	11.62	10.51	12.41	10.66	11.68	8.95	12.2	9.34	10.35	9.2	12	10.36	11.34	9.39	12.21
Dissolved Potassium	2	1	2	2	<1	<1	1	1	4	3	3	3	<1	<1	1	1
Dissolved Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Silver	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Sodium	2	2	4	5	2	2	4	4	3	3	4	4	2	2	3	4
Dissolved Thallium																
Dissolved Zinc	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Flow (Field)	TH	TH	NM	68	TH	TII	NM	16	1.1	0.51	0.14	0.14	123	147	18	11
Fluoride	0.14	0.08	0.15	0.15	0.71	0.62		0.82	0.14	0.11	0.16	0.14	0.81	0.64	0.77	0.82
Gage Height (Field)			7.95	7.78	2.25	1.72	0.3	0.25	0.38	0.26	0.14	0.11	2.8	2.94	1.79	1.66
Hardness	16	17	32	40	15	18	38	43	70	92	135	125	18	16	36	42
Nitrate + Nitrite as N	0.06	<0.05	<0.05	0.1	<0.05	<0.05	<0.05	0.41	0.21	0.24	0.09	0.13	<0.05	<0.05	<0.05	<0.05
Oxidation Reduction Potential (Field)																
pH (Field-Standard Units)	7.48	7.66	7.81	7.05	7.41	7.63	7.74	7.52	7.84	7.94	8.13	7.62	7.49	7.46	7.79	6.95
pH (Standard Units)	7.15	7.47	7.85	7.88	7.09	7.41	7.9	7.89	7.46	7.72	8.05	7.97	6.94	7.34	7.73	7.73
Sulfate	2	3	5	11	1	3	4	7	37	69	83	80	2	2	5	4
Total Acidity	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Total Alkalinity	16	21	36	38	37	20	41	43	43	36	54	53	18	16	38	42
Total Dissolved Solids	57	44	51	59	33	31	53	52	125	142	180	178	46	26	52	70
Total Recoverable Aluminum	9.25	0.75	0.14	0.16	1.62	0.26	<0.08	<0.08	12.6	0.27	0.09	<0.08	1.2	0.22	<0.08	<0.08
Total Recoverable Antimony																
Total Recoverable Arsenic	0.23	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Recoverable Barium																
Total Recoverable Beryllium																
Total Recoverable Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0008	<0.0001	0.0015	<0.0001	<0.0001</				